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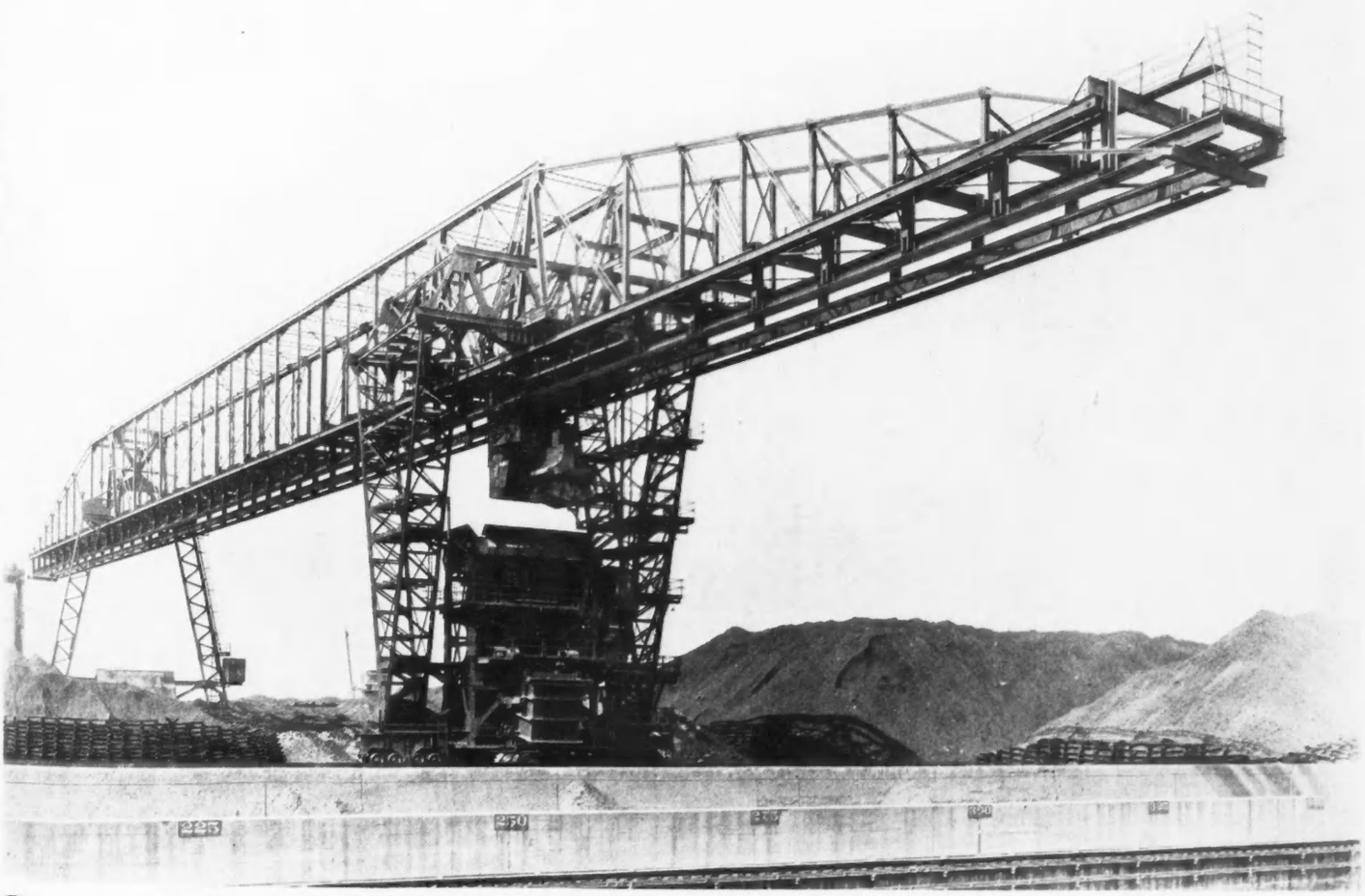


Replacing the structure blown down last year, the new ore bridge of the New York Central Railroad at Ashtabula Harbor, Ohio, serves a storage dock having a capacity of 1,250,000 tons of iron ore. See page 273

The New Plant of the Utah Ore Sampling Co.

By Owen H. Gray

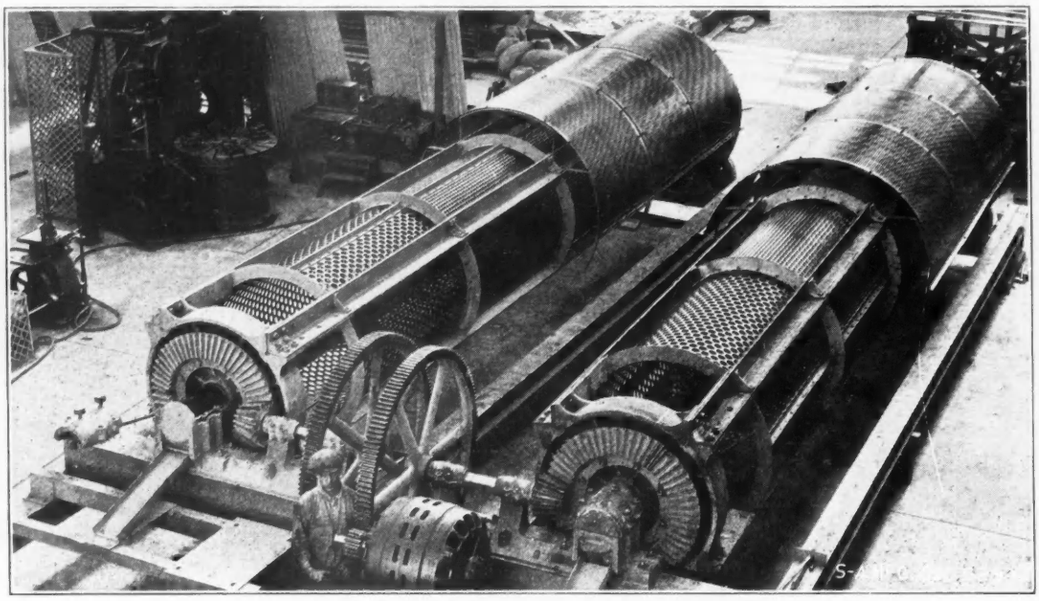
Mining Limestone by Glory Holes in California

By George J. Young

Cost of Shaft Sinking at Cripple Creek

By William Spence Black

Graphs of Current Metal Prices



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ENGINEERING AND
MINING JOURNAL-PRESS

JOSIAH EDWARD SPURR, Editor

Volume 120 | New York, August 15, 1925 | *Number* 7

The Petroleum Debate

A REAL NEED of the United States today is an umpire who shall decide which of the petroleum experts is right—the one who says the nation's petroleum supply is adequate and the nation safe, or the one who says that the supply is dwindling rapidly and that the country must look ahead to a possible coming war. Each side of the question has its able champions, and the net result of the decisionless debate is confusion and uncertainty. If the nation's safety is in any degree imperiled, or apt to be, for want of oil, then its petroleum resources should be carefully conserved. Indeed, in no case can their reckless waste be calmly viewed. Even a city's water supply should be husbanded carefully, however generous it may be.

But there are ways and ways of conserving oil, and some of them perhaps would prove a hardship and too great a handicap on the industry and possibly unjust to individual producers. All will doubtless agree that petroleum should not be wasted, and so the question narrows down to how and to what degree conservation shall be effected and to what extent, if any, the government shall take a hand. It is hard to see how governmental supervision of some degree can be avoided. Production without restraint in many fields may mean considerable waste. The idea that petroleum is not wasted so long as it is marketed, even though it may practically be given away at the price it brings, is faulty. When a commodity is unduly cheap, it may be put to unwise and hastily considered uses which in the end spell waste.

Until Mr. Doherty gained wide publicity for the proposed conservation plan that bears his name, the public utterances of men prominent in the industry stressed heavily the grievous waste of petroleum throughout the country. Overproduction meant low prices. Perhaps it is not unfair to say that the attention the plan received and the appointment of the President's Conservation Commission caused this tide of utterance to turn so that today we hear in public speeches of reserves ample for all purposes where once there loomed great shortage. Perhaps reserves are ample; if they are, so much the better. But the conflict and reversal of opinion are confusing, and an umpire is needed to decide.

The most recent spokesman for the optimists is J. Edgar Pew, president of the American Petroleum Institute, who has just submitted to the Petroleum Conservation Commission a report that ought to be reassuring. It would be reassuring, if it were not for haunting memories of the public statements of other equally prominent individuals that were not so rosy. The report has been prepared by a committee of eleven of the directors of the Institute, of which committee Mr. Pew is chairman. Its optimism is summed up in its statement that it is reasonable to assume that the oil resources of the United States, including oil from wells, shale, coal and lignites, assure the country of a sufficient supply of motor fuel and lubricants for the national defense and for essential uses beyond the time when science will limit the demand by developing more efficient use of, or substitutes for, oil, or will displace its use as a source of power by harnessing a natural energy. Thus the existence of a full and abiding faith in the ability of man to advance indefinitely in scientific achievement is evidenced in the committee members. However, a bird in the hand is worth two in the bush, Mr. Pew should remember, and an abundance of petroleum should not be squandered today in the hope of harnessing Old Sol or Father Neptune tomorrow.

Fortune Smiles on the Lead Producer

AS A CLASS, lead producers have enjoyed three years of unusual prosperity, far beyond that experienced by the producers of any other metal. Prospectors and holders of undeveloped properties have found more ready market than usual for any claims that appear at all promising, for none of the large companies is turning down lead-silver prospects without investigating them carefully. Operating mines shipping ore and concentrates are getting high prices for their product, enabling them to be liberal with development and equipment expenses and have a good profit left. The smelters are operating at capacity, and with the schedules that are in force are getting paid more per unit smelted than they would if lead prices were lower. The manufacturer of lead products is also working at or near capacity, and is not worrying about the high price of his raw material, because the price of his finished product is correspondingly higher. Even the ultimate consumer cannot complain: a large proportion of the lead goes into batteries, lead-incased cable and paint; automobiles, containing the batteries, are cheaper than ever; rates for electric power, telephones, and telegraphs are little if any higher than they were before the war, and the cost of the paint in painting one's house is so overshadowed by the cost of the labor that it is of small moment. So the benefit seems to extend all the way down the line—what might be called a vertical trust of lead prosperity.

Now, how long will this last? Most good things are rather short lived, and as the lead market has been between 6 and 10c. for three years, is it not about time for a reaction? Fortunately, no dark clouds can be detected on the horizon. The demand is world wide, and is largely brought about by the increased harnessing of electricity, which may be expected constantly to increase. No new deposits of sufficient importance to increase materially the world supply are being developed or are even known to exist. Even at present high prices, production is not increasing, nor is it likely that any marked increase would be brought about should prices advance several cents further. Few lead mines have such poor ore that they cannot make a profit at present

prices. Lastly, no important use of substitutes need be feared unless prices get out of all reason. Substitutes can and are being used to a certain extent in paint, for lead foil, and some minor uses, but tonnage is not materially affected.

A lead famine is not to be expected, for continued high prices will stimulate production in existing properties all over the world. But continued prosperity for some years to come seems more than likely, and lead producers would seem to have little to worry about except depletion.

Engineering Students Under the Microscope

DO ENGINEERING UNDERGRADUATES realize the intensity with which they are being studied, or are they, as microbes beneath a microscope seem to be, oblivious to the close scrutiny to which they are subjected? Possibly the bacterium stares back, giving look for look, and possibly the student is conscious of the attention he is getting and accepts it as his rightful due. At all events, he is receiving it and might profit by giving it regard.

Following close upon the report made to the Society for the Promotion of Engineering Education, at its recent meeting at Schenectady, that more than 60 per cent of the students in the engineering colleges of the country fail to graduate and that less than 30 per cent complete the four-year course within four years, come further data on the subject from the Interior Department's Bureau of Education at Washington. This latest report summarizes the number of students enrolled in 121 engineering schools in the United States from 1921-22 to 1924-25, inclusive. Of the total enrollment of 56,766 students in the freshman, sophomore, junior, and senior classes in the academic year 1921-22, those studying mining and metallurgical engineering numbered 2,895. Of these, 1,824 were enrolled in the freshman and sophomore classes, separate figures for which are not given. In the following year, 1922-23, the junior classes totaled 514, indicating a large percentage of elimination at the end of the sophomore year, and in 1923-24 the enrollment in the senior classes showed a further shrinkage to 473. Freshmen and sophomores enrolled in the academic year 1922-23 numbered 1,545; but in 1923-24 the juniors were only 447 strong, and in 1924-25 the senior classes could show only 332 in all.

It is not only among the mining and metallurgical students that the dwindling in the size of the classes as they pass along the four-year course is noted. The report shows that a similar condition exists in the civil, mechanical, electrical, and chemical engineering courses also. This tallies with the statement of conditions given at Schenectady. But the bureau's report also shows that the freshman and sophomore classes in mining and metallurgical engineering decreased steadily in size from 1921-22, when 1,824 were enrolled, to the year just ended, when only 898 names were on the rosters. No such marked decrease in the entering classes is visible in the other engineering courses, save in chemical engineering. Electrical engineering students, on the contrary, show a decided increase.

It is not hard to find good reasons why the number of students selecting mining should diminish in the last few years. Perhaps most engineers would not regret to see the supply of young graduates greatly lessened, for a while at least, though the mining schools, of course, would suffer. It is not that the mining industry today does not present opportunity for young engineers to get a footing and rise to positions of importance, but rather that the number of applicants for such positions has been so great that the market for their services is decidedly weak—a buyers' market, with the sellers meekly taking what is offered.

The Responsibility of the Engineer

FRANKLY ADMITTING that he is not familiar with the methods used by competent mining engineers in examining mines, a correspondent writes for enlightenment on the "correctness" of a procedure which he describes as follows:

"To begin with, the engineer examined the surface and the outcrop of the vein; when it came to entering the tunnel that cuts the vein at depth, he requested that the owner remain outside while he made his examination. He did not want the owner to show the vein or explain the situation to him. The engineer went in alone and obtained samples—God and the engineer himself only know from what places. He reduced the samples in size and carefully deposited them in sealed bags. The following day the owner saw the rejected portions and asked if the samples for assay were from the same lots. Assured that they were, the owner told him plainly that the samples had not been taken from the vein, and declared that the results of the assays could not do justice to the mine and would be misleading to anyone valuing the property. The engineer, however, insisted on having the assays made. As predicted by the owner, the results were low, averaging about 4 per cent copper. Previous samplings from different places and by various assayers had shown the minimum copper content to be 6 per cent and to run as high as 47 per cent, with an average of 17.5 per cent."

This suggests a number of misconceptions of the functions of an examining engineer that are frequently entertained by laymen. In the first place, it is clear that the engineer is making the examination on behalf of a prospective purchaser. He is responsible solely to his employer, with due regard of course to his own professional reputation. The putative buyer wants advice as to what, if anything, the property is worth, and the business of the engineer is to give him an expert opinion on the question. If he is jealous of his reputation, he is not going to condemn a good property any more than he would pass favorably on a worthless one. His method of arriving at an opinion as to the value of a prospect is entirely his own business. Usually an engineer will have the vendor or his representative show him through the workings and point out what he considers the good features and show him where the best veins are. Apparently in this case the development was so limited—simply an adit to and probably through the vein—that time would be wasted in having the owner make a trip for even a preliminary inspection. Even if the workings were extensive, the engineer would be fully justified if he preferred to make his examination without being prejudiced by the opinions of the owner.

When it comes to taking samples, the recognized procedure is for the work to be done by the examining engineer and assistants of his own choosing, whom he usually brings with him. If this is impracticable because of the size of the job or the remoteness of the

property, the selection of samplers is one of the most important parts of his work. Much greater precaution must be taken in sampling if gold or silver is the metal instead of copper, but in no event should the owner or his representatives expect to participate in or even to observe the sampling. It is none of their business where or how the samples are taken, and if they are not around they cannot tamper with the samples or the tags or in any way influence the result.

It is not to be insinuated that the average mine owner is dishonest; but the instances of "salting" are so numerous that the only safe way is the custom that has been established of having none but the engineer and his trusted assistants present when samples are being taken and assays made.

Our correspondent complained that the samples had not been taken from the vein. Though details of conditions are lacking, it is possible that the engineer was trying to determine the copper content of a wide zone rather than the rich vein. Perhaps the vein was too narrow for stoping and he sampled over a stoping width. Whatever the reason, the engineer was justified. One sample might have been enough to satisfy him regarding the rich ore; fifty might have been necessary to determine the possibilities of the lower-grade material. He wanted to obtain certain information for his own guidance, and any methods that he saw fit to employ are "correct" so far as the vendor is concerned.

An automobile salesman might advance the argument in favor of his machine that it could travel at the rate of ninety miles per hour. But the buyer might be more interested in reaching an opinion on whether it would give comfortable transportation for 200,000 miles at the rate of thirty miles an hour. If he subjected the machine to fifty tests to help him decide this point, the salesman should not complain if he determined to forego the thrill of stepping on the gas for a ninety-mile test.

Undercut-Caving in Copper Mining

THE AGGREGATE PRODUCTION of Inspiration, Ray, and Miami up to Jan. 1, 1925, was 95,979,349 tons of ore, from which 1,101,686 tons of copper was produced and from the proceeds of which $92,689,865 in dividends has been paid by the three companies. The volume of ore mined would make a cube 1,062 ft. on an edge.

Although the record of these three properties is of interest to mining men generally, the mining methods by which these huge quantities are won from relatively shallow depths underground is of greater technical interest. Present methods are all variations of undercut-caving. Each mine has developed a practice more or less distinctive and therefore differing in important details. These methods were derived from two older methods, block-caving and shrinkage stope and pillar mining. Block-caving can be traced back to caving methods used in the Michigan iron-mining districts. Felix Macdonald was responsible for the introduction of systematic block-caving in Utah at the Ohio mine. The important principles of this method are included in the modern variations of undercut-caving. However, all of the applications now involve retreating from one end of a block to the other on a face 150 ft. or more in width. The undercutting is in progressive stages, whereas at the Ohio mine a block 100 ft. square was caved as a single unit. Drawing is now so conducted as to bring the caved cap rock down on an angle of 40 deg. or more. At the Inspiration mine, ore is drawn from the undercut areas and sent by a system of inclined raises to main haulage levels, where it is loaded. At both Miami and Ray, undercut areas are served, in part or wholly, by hand-tramming drifts in which the ore is trammed relatively short distances to raises serving the haulage levels. In all three mines, shrinkage stoping is employed as a supplementary method for the purpose of establishing the limits of the section being mined. Dilution is guarded against by systematic drawing under close control.

In contrast with the foregoing, the Michigan copper-mining area produced in the twenty-five-year period ended with 1923, an aggregate of 226,305,155 tons of ore yielding 2,693,000 tons of copper. The mines of Silver Bow County, Montana, produced in the twenty-year interval ended with 1923, 96,000,164 tons of ore, the copper production of the county being 2,517,300 tons for the same period. The greater part of the ore was derived from the Butte district. Mining methods in the Michigan copper mines are modifications of overhand stoping with waste filling. In Butte the methods are likewise variations of overhand stoping with waste filling. In both areas, the mining is conducted at relatively great depths.

Undercut-caving accounts for a daily production of about 40,000 tons of copper ore per day at present. It is therefore one of the most important mining methods applicable to large low-grade copper deposits. Its systematic development has been brought about by the combined efforts of mine superintendents, foremen, shift bosses, and technical men. The low operating costs obtained, ranging from 68c. to $1.30 per ton, make practicable the exploitation of such low-grade deposits as those at Ray and Inspiration.

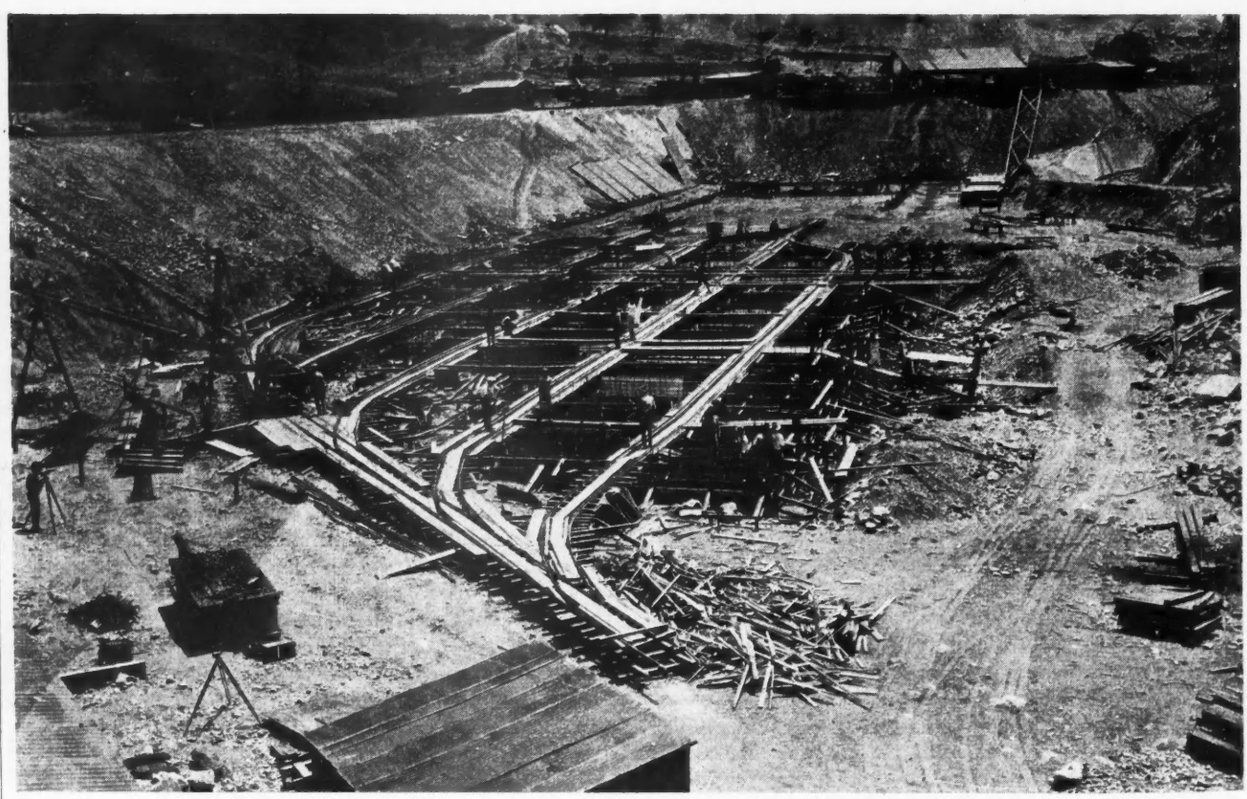
Spending Public Funds

THE PRESENT GOVERNOR of New York and his predecessor recently debated in public as to the advisability of giving the Legislature authority to bond the state for $100,000,000, at the rate of $10,000,000 a year for the next ten years, without specifically stating how the money is to be spent. The crux of the matter is whether it is wise to give a group of politicians ten millions a year to spend as they please. No great sagacity or knowledge of men is required to know that such a proposal generally means "pork." The speaker for the negative stated this quite convincingly.

It is in the lessons of the past that the guide for the present is found. Consider the $8,500,000 made available for war minerals relief following the close of the great conflict. Administered at the start by an able commission of three who scrutinized all applications closely and turned down those that savored of fraud, the fund diminished slowly. It proved too slow for the hungry ones, the law authorizing relief was liberalized, a politician succeeded the engineer commissioners, and the flow of the funds into the pockets of the "needy" was hastened. Last June the law was further liberalized to remove the $8,500,000 limitation. As matters stand, the sky is now the limit, and the end is not in sight. A good example of how great a temptation a fund that is waiting to be spent may prove when carte blanche is given in its spending! The debaters in New York will have no difficulty in finding similar cases.

Inspiration Consolidated's New Leaching Plant

Site of $6,000,000 leaching plant that Inspiration Consolidated Copper Co. is building at Miami, Ariz., to treat its mixed oxidized and sulphide ores, as it appeared on July 1



Pouring concrete for substructure of leaching plant's solution tanks, July 1

A New Custom Sampling Plant at Murray, Utah

Cutter of New Design; Elimination of Elevators; and Minor Improvements—Owned by Utah Ore Sampling Co.

By Owen H. Gray
Mechanical Engineer, Salt Lake City, Utah

THE NEW PLANT of the Utah Ore Sampling Co., which began handling custom ore in June, 1925, was built to replace an old mill of smaller capacity at the same site at Murray, Utah. The new mill, which has a rated capacity of 100 tons per hour, contains standard crushing, conveying and power transmission equipment, and the design embodies the ideas gained by the company during its many years of experience in sampling all kinds of ores.

As the various constituents of an ore range in size from the finest dust to large lumps and are very irregularly distributed, a theoretically correct sample could be obtained only by crushing the whole lot of ore to the finest imaginable dust, letting it fall in a fine stream and by taking an almost infinite number of fractional cuts across this stream.

A sample that is correct within the practical limits of tolerance can be obtained by the following process used by the Utah Ore Sampling Co.: The ore is first crushed as small as the allowable sampling charge will permit (1½ in. maximum at this mill) and dropped in as uniform a stream as possible through a sampling machine or "cutter," which cuts forward and back entirely across the stream at frequent regular intervals. This divides the stream, 20 per cent sample and 80 per cent reject. The sample is then crushed to one-half size (¾ in. maximum) and passed through a second cutter, which again removes a 20 per cent sample as described above. The sample continues in this manner, being crushed to half size and having four-fifths rejected at each step, until after passing the fourth cutter and last set of rolls the sample is reduced to 0.16 per cent of the original quantity of ore and to a size less than 10 mesh.

This sample, amounting to about 150 lb. for an average carload, is then further subdivided, dried, crushed, subdivided, and mixed by the most careful and approved methods until about 3 lb. of pulp remains. This is then placed in six properly numbered, labeled, and sealed packages for delivery to the seller and buyer and for the sampling company's files.

It should be noted in connection with the foregoing that as each time the maximum-sized particles or ore are crushed to half size their number is increased approximately eightfold, and as one-fifth of these are taken into the following stage of sampling, the total number of these particles in the retained sample increases from stage to stage. This tends to give greater and greater accuracy in the sampling at succeeding stages.

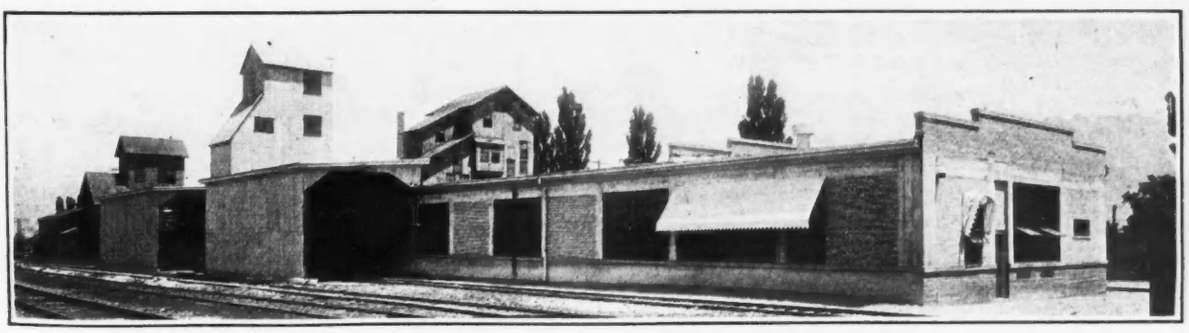
The process of sampling a shipment of ore, as practiced in this new mill, can be understood best by referring to the accompanying flow sheet. The ore is dumped or scraped out of the car, through grizzly bars on 12-in. centers, into a steel receiving hopper large enough to hold a maximum-sized carload. Lumps of ore too large to pass the grizzly bars are broken down by sledging until they drop through. Surrounding the hopper there is a floor of sheet steel and extending a car length up and down the track there is a tight plank floor so as to catch spilled ore, which is then swept into the receiving hopper without loss or contamination.

Reload Into Original Car

When the car is empty and has had all ore blown off its underframing by compressed air, it is rolled forward to the track scales, under the reloading chute ready to receive its original load of ore after the ore has passed through the mill.

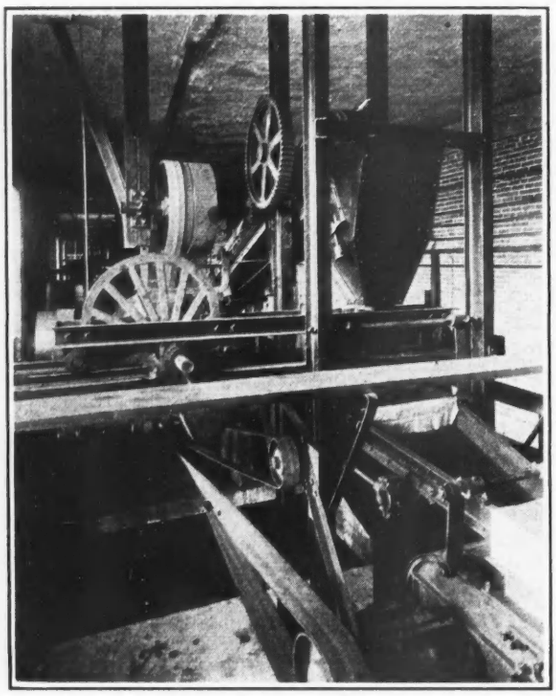
From the receiving hopper the ore passes onto a 30-in. steel pan conveyor running at 30 ft. per minute, controlled by a friction clutch, discharging onto a shaking grizzly. The oversize lumps are fed by this grizzly into a 15x24-in. jaw crusher running at 300 r.p.m. and set to crush to 3 in. or finer. The product of the crusher joins the undersize from the grizzly in the hopper feeding a 24-in. belt conveyor and passes by way of a shaking pan conveyor to a set of 54x16-in. rolls set to crush to 1½ in. or finer.

All of the ore is then raised by a second 24-in. belt conveyor to a small hopper, from which it passes through an 8-in. rectangular opening into the first cutter. From this cutter 80 per cent of the ore goes directly into the boot of the elevator and is raised to



Sample building at Murray, Utah

Office and sample room are in end of building to right. The two sheds to left cover unloading hopper and track scales, respectively. Tops of old sampler buildings are shown above new sampler



The Utah Ore Sampling Co.'s cutter

The cam that actuates the cutter is seen at left center. At upper right is the hopper into which ore is delivered from the belt conveyor and fed to the cutter. Underneath the cutter is the shaking pan feeder, which delivers the ore to the rolls below.

the reloading bin and 20 per cent, retained as sample, passes by way of a shaking pan feeder into a set of 36x16-in. rolls, which crush it to ¾ in. or less. Raised again on a 14-in. belt conveyor, this ¾-in. product passes a 6-in. cutter. The 80 per cent rejected by this cutter flows through a chute to a 16-in. belt conveyor running horizontally, just below floor level under the last three sets of rolls and carrying their rejects into the elevator boot. The sample, now reduced in size to ⅜ in. or less and in quantity to 4 per cent of the original ore stream, is twice more raised, subdivided and crushed, as shown on the flow sheet, passing through two 5-in. cutters, a set of 24x12-in. rolls and a set of 18x10-in. rolls before being collected in a steel sample buggy inclosed in a dust-tight safe under the last set of rolls. It will be seen from the above that the operation is entirely automatic from the time the ore is dumped from the car until the sample is received in the sample safe.

After all the ore has passed through the mill, the sample is taken from the safe into the cutting and bucking rooms for further treatment, as already described.

After each lot of ore has been run a thorough cleanup of the plant is made by means of brooms, scrapers, and compressed air, so that all parts of the mill and equipment are freed from the ore of one lot. This is all collected in the overhead bin and reloaded into the car before a new lot of ore is started through the mill. Great pains are taken in this cleanup so as to avoid accidental salting of one lot of ore by leavings from any other. A 9x8-in. Ingersoll-Rand compressor furnishes air, which is piped to all parts of the mill.

The use of a shaking pan feeder for receiving the sample from each cutter and discharging it into the next set of rolls, together with the use of belt conveyors rather than bucket elevators for handling the sample, gives a steady flow of well-mixed ore through each cutter, thus conducing to accuracy of results.

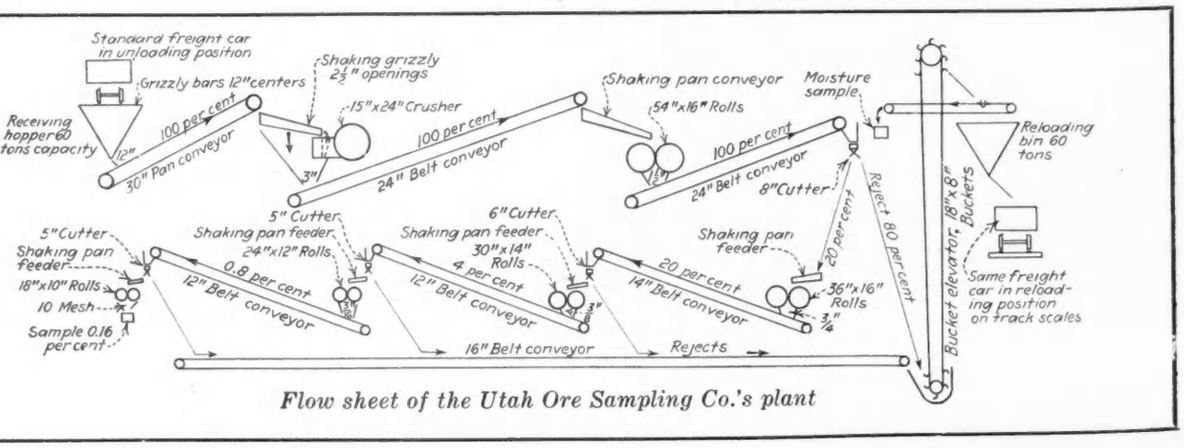
The sizes of ore, as shown on the flow sheet, under each set of rolls are the maximum allowed for ore of ordinary value and characteristics. For special high-grade ores the rolls are set up to give smaller sizes.

All of the cutters are designed to take a 20 per cent sample. The 8-in. cutter makes forty cuts per minute, the 6-in. cutter forty-two cuts per minute, and the 5-in. cutters forty-four cuts per minute. The percentage figures shown above each conveyor show the percentage of the original ore stream carried on that conveyor.

This plant differs from the earlier types of sampling mills in that all of the crushing units are on one general floor level; that belt conveyors are used instead of bucket elevators; and that a new type of sampling machine designed by the company's engineers is used. Exclusive of an office, cutting, and bucking rooms on one end and a blacksmith shop on the other, the mill proper consists of a one-story building 22 ft. wide by 212 ft. long by 14 ft. high from main floor level to ceiling. The building is constructed of reinforced concrete columns and beams with brick curtain walls and large steel sash, which make an unusually light mill.

All Heavy Machinery on Solid Foundations

If the earlier designs had been followed for a mill of this capacity, it would have been necessary to build a tall and very strong and expensive building in order to support and prevent vibration from the heavy crushing rolls, or else the sample would have had to be elevated at one or more points by means of bucket elevators. With the arrangement adopted, each crushing unit rests on a heavy reinforced concrete foundation carried directly to the ground, so that there is no vibration in any part of the plant. In spite of the large ground area covered, this mill has cost no more than



Flow sheet of the Utah Ore Sampling Co.'s plant

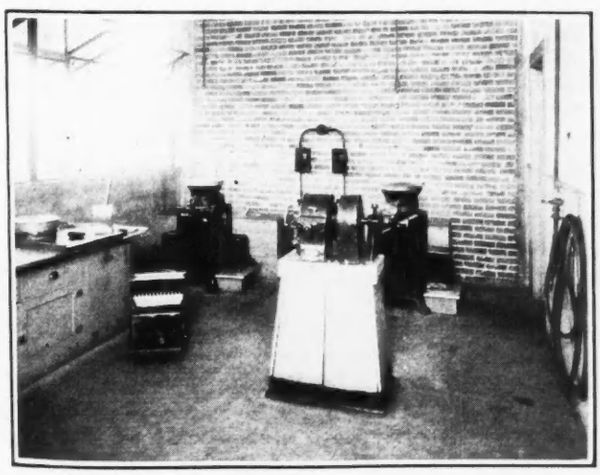
the vertical type mill of the same capacity would have cost. For handling sample ore it is believed that belt conveyors have a great advantage over bucket elevators or long, crooked chutes, because they can be cleaned readily and present no pockets or inaccessible places where ore might lodge. The use of belt conveyors as ordinarily installed would not be permissible in a good sampling mill, because of the spill from the belts. It was recognized by the management at the start that it would be imperative to provide an efficient means to prevent all spill from either wet or dry ore. This has been accomplished in the new mill by using a special arrangement of thin rubber skirts on every hopper that feeds a conveyor belt; by installing a rotating fiber or steel wire brush on the underside of the head pulley of each conveyor; and by using skirt boards throughout the whole length of each of the conveyors carrying sample, to which are tacked canvas strips dragging lightly on the top surface of the belts near the edges.

The ore-sampling machines, or "cutters" (shown in the accompanying illustration), were designed in an attempt to preserve the good features and avoid all defects and disadvantages either inherent in or incidental to most of the previous designs. Without going into a detailed discussion, it may be said that a cutter to take a strictly correct sample from a falling stream of ore must have the following characteristics:

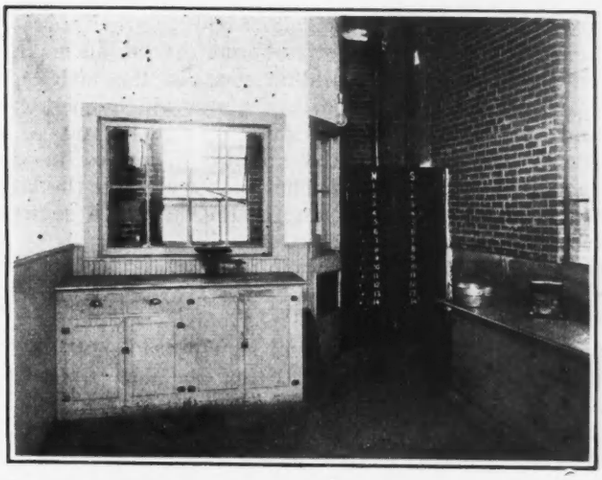
1. The sample opening with its knife edges must cut entirely across the stream of ore at frequent regular intervals of time.
2. It should move in a straight line or at least in one plane.
3. It must move at a uniform velocity while cutting across the ore stream.
4. It should have a reciprocating motion—that is, it should pass forward and back across the stream so that the return trip will compensate for any selective action on the forward trip.

And for mechanical reasons the cutter should take up little head room, it should have steep sloping chutes and no places where wet ore will stick, its knife edges should not wear into curved lines and should be easily renewable, it should be so designed that ore sticking to any part of the reject openings and compartments can never drop into the sample, its wearing parts should be renewable, and the entire machine should be rugged and long lived.

The Utah Ore Sampling Co.'s cutter fulfills all of these conditions. A carriage mounted on roller-bearing wheels and carrying a sample opening moves back and forth in a straight line. It is actuated by a cam driven by bevel gears running at constant speed so that the sample opening travels at a uniform velocity while any part of it is under the ore stream. Patents for this machine have been applied for.



The bucking room, showing sample grinders, bucking board, sample splitter and air hose for cleaning up



The bucking room, showing electric sample drier, work benches, cupboards, and drawers

For handling cars of ore there is a straight railroad track parallel to the west side of the mill with a down grade in the direction of travel. Ore cars are placed upon this track beyond the south end of the mill by the switching locomotive and are rolled down one at a time as needed to the receiving hopper. After being unloaded, the car is rolled forward about 100 ft. farther down the track on to the track scales, where it is under the chute from the reloading bin ready to receive the same carload of ore. On account of this arrangement of bins, the straight track, and the down grade in the direction of travel, no switch engine is needed from the time the cars are first delivered until they are ready for shipment.

With the exception of the pan conveyor and jaw crusher, which are in a pit below the general floor level, and the reloading bin in a tower above, all other equipment is on the main floor level. A narrow basement 7½ ft. below the main floor runs the entire length of the mill and gives access to the hoppers under the rolls and the lower ends of the belt conveyors. The reject conveyor also runs through this basement. All main and basement floors are made of concrete laid directly on the ground. All of the crushing rolls and belt conveyors with the exception of the first conveyor are installed with their centers in one straight line.

An aisle from which all machinery is fenced off by pipe railing runs the entire length of the mill. This aisle provides a means for moving parts of any of the machines down to the blacksmith shop for repairs and from it visitors and operators can see the entire process of sampling, including the operation of all four of the cutters.

Each set of rolls, together with its shaking pan, cutter, and conveyor, is driven by rubber belts from a countershaft the bearings of which are carried on concrete pedestals resting directly on the main floor. The countershaft for each unit is driven by a separate electric motor through a Morse silent-chain drive with dustproof housing. Each motor stands on a concrete base projecting about a foot above the floor level. There are nine motors in all, ranging from 5 to 75 hp. They

are all 220-v., three-phase, alternating-current induction motors. The starters for these motors are all mounted on the wall of the building next to the aisle, each starter being placed opposite the unit which it controls; and all are equipped with overload and no voltage release. All wiring to the motors is carried in steel conduit under the floor. The track scales are the latest type Fairbanks-Morse manufacture, having a registering scale beam of 250,000 lb. capacity.

The crushing rolls are equipped with "fleeting" devices and were all furnished by the Traylor Engineering & Manufacturing Co. All conveying equipment and most of the power transmission was furnished by Stephens-Adamson Manufacturing Co. The general design of this mill was outlined by E. G. Jensen, general manager of the Utah Ore Sampling Co., and the details were worked out and construction was supervised by Gray & Murdock, engineers and contractors, of Salt Lake City.

A Sketch of St. John del Rey

WITH A RECORD of nearly a century's work behind it, the history of the St. John del Rey —the deepest ore mine in the world—is one of extraordinary interest, as a recent sketch in *The Mining Journal* (London) points out. The company commenced operations in Brazil at St. Joao del Rey, in the State of Minas Geraes, from which it derives its name. Mining operations in that locality were unsuccessful, and in 1834 the Morro Velho mine (usually referred to as the St. John del Rey) was purchased for £56,434. It is situated about 2,700 ft. above sea level and fifty miles from the old capital of Minas.

The lode lies in a calcareous schist, possibly of pre-Cambrian age, and the ore itself consists mainly of massive pyrrhotite, with mispickel and iron pyrites, and is remarkable for the regularity of its character and composition. A typical analysis is as follows: Pyrrhotite, 28.5 per cent; mispickel, 5 per cent; iron pyrites, 6.5 per cent; silica, 24 per cent; together with calcium, magnesium, and iron carbonates, 36 per cent. A small amount of copper pyrites is usually present. The ore lode appears from the vertical cross-section of the mine as a vein 600 ft. or more in length (45 ft. in width), dipping at an angle of about 45 deg. Although changes have occurred in the length and width of the orebody during development at depth, it has on the whole maintained extraordinary regularity in size and gold content, and the fluctuations in returns are largely to be accounted for by the conditions and difficulties under which mining operations were effected. For the first five years of the company's operations the profits were almost nil.

Development and Exploration of the Mine

The mine was originally worked as a steep open-cast, and propped up by heavy timber work and pillars. In 1867 a fire and collapse of the open-cast workings necessitated the cessation of operations, and it was not until six years later that the lode was reopened. Two shafts, 1,122 and 1,422 ft. deep, were sunk, but the system of removing the ore by one large excavation resulted in a gradual caving of the ground. Returns fell away, and in 1886 the mine once more collapsed. Exploration in the neighboring district in the hope of finding other productive lodes was futile, and two new vertical shafts to the north of the lode were sunk, each to a depth of 382 fathoms, this work being completed in May, 1892. Since that date the mine has been developed by a series of internal shafts, each 1,200 ft. deep, in steplike succession, 1,420 ft. apart. The total (vertical) depth is now 6,800 ft., the lowest portion of the mine being reached by two inclined shafts, the lode having flattened to 19 deg. Inclined shafts were attempted from the eighth to the eleventh horizon—that is, 900 ft.—but the system failed, owing to the flaking of the schist and consequent falls of ground.

One of the great difficulties the mine has had to contend against is that of increasing temperature with depth—1 deg. F. for every 125 ft.; at 6,500 ft. the initial rock temperature is 118 deg. F., with an air temperature of 110 deg. F. Air cooling—pioneer work in the mining industry—is effected by a Sirocco fan delivering 80,000 cu.ft. of air per minute, and supplemented by 5,000 cu.ft. of compressed air from the winding engines, which are driven by that means—85,000 cu.ft. in all. The air from the surface is cooled in steel drums revolving in chilled water delivered at the twenty-second (6,500-ft.) level at a temperature of 81 deg. F., the temperature being reduced to about 43 deg. F. in the refrigerating plant.

The power for working in the mine is exclusively confined to electricity and compressed air, and the whole of the power for the plant is either hydraulic or hydraulic power transmitted electrically from eight small power stations. About 4,000 hp. is at present being utilized, and steam and gas engines of about 900 hp. are kept in reserve in case of breakdowns. Compressed air at 60 lb. per square inch is used for both winding engines and rock drills, and 15,000 ft. of steel pipe, 10 to 12 in. in diameter, conveys this from the surface to the bottom of the mine.

Underground Work and Milling

Stopes are filled by material lowered from the surface in cars as the ore is worked out. The system is expensive, but has its compensations in assisting hoisting—a matter of some importance where power is limited, as is the case at Morro Velho. About 400 tons of "filling" per day is lowered into the mine.

The ore received from the mine is hauled by chain haulage to the mill, and weighed. From the weigh bridge it passes to a picking-table, where waste rock (about 2 per cent) is rejected, and thence to the ore bins. From the bins the ore is fed to the stamp batteries—120 head of 750-lb. and 20 head of 1,200-lb.—and crushed to 60-mesh screen. It then passes over strakes (area 17,126 sq.ft.), on which free gold (to the extent of 70 per cent of the total value) is caught. The tailings are all slimed in tube mills, and subsequently cyanided in agitation vats, where a further 25 per cent of the values is recovered, 5 per cent being lost in the tailings.

Passing mention is made of the machine shops and foundry, the brickfield, hydro-electric stations, and wood distillation plant. Free medical attendance is provided for all employees, and a hospital, replete with the latest appliances, belongs to the company, and has seven wards fully equipped. The company owns 100,000 acres of land, and iron and manganese deposits of exceptional quality and quantity have been discovered, but await more promising conditions of transport and labor before being developed. St. John del Rey has produced 130 tons of bullion since it commenced operations, representing a sum of approximately £15,000,000.

Mining Limestone by Glory Holes in California

Method Requires Transfers, Bulldozing Chambers and Loading Chutes — Stripping by Steam Shovel

By George J. Young
Associate Editor

DAVENPORT, CALIF., is on a terrace that terminates in an irregular beach line at the Pacific. It is about twelve miles northwest of Santa Cruz and is served by a branch line of the Southern Pacific extending from Santa Cruz. The cement plant of the Santa Cruz Portland Cement Co. is on a sloping site not a great distance from the ocean. The limestone quarry is about three miles distant in the westerly spurs of the Coast Range. A railroad, three and one-half miles in length, 3-ft. gage, with maximum grades of 2.1 per cent compensated in favor of the loaded trains, connects the quarry with the crushing station of the plant.

General view looking in the direction of the axis of quarry, along line of draw pits

The original quarry was opened out in a narrow deep ravine, San Vicente canyon, and was worked by a single bench with steam-shovel loading and delivery of the limestone to a crusher and finally to bins placed in a narrow part of the ravine. The limestone was loaded from the bins into cars and transported by steam locomotives to the plant at Davenport over a standard-gage track. As the quarry face advanced, it became higher and higher until it reached a height of about 350 ft. Caving from the sides and inrush of sand caused by heavy rainfalls finally caused cessation of operations for the time being and resulted in a complete change of method.

Robert A. Kinzie, a metal-mining engineer, was placed in charge of quarry operations. Kinzie initiated a new method which combined glory holes, transfer raises, bulldozing chambers, chute loading and adit transportation in a smoothly working system that has already delivered about 500,000 tons of limestone to the cement plant at a greatly reduced cost and that is rapidly reaching the condition of normal operation. As a preliminary to the work, diamond-drill holes were put down at a number of points and the position and approximate size of the deposit were established. This work indicated a much greater quantity of limestone than had been expected and insured operation of the cement plant for a long period.

Deposit 1,200 by 4,000 Ft.

The limestone deposit lies on a basement of diorite or granodiorite and is covered in part by an overburden of soil and in part by a medium-grained gray sandstone. The form of the deposit is not definitely known, but is assumed to be more or less trough shaped, the principal axis being coincident with the trend of the ravine and about three-quarters of a mile long. The width of the deposit is about 1,200 ft. The limestone is metamorphosed to the extent that its original bedding planes are obliterated and it is practically a homogeneous mass

The stripping level

more or less interrupted by water courses, slip planes, and some faults. It is, on the whole, of a compact, firm texture, light gray to white in color. Magnesium carbonate is not present. It occurs in the Franciscan formation. The topographic environment is extremely difficult for any system of benches and steam-shovel loading. A switchback system would be necessary to reach the quarry benches and the maintenance and operation of this would add materially to the operating cost.

Quarrying and Stripping

The present quarrying operations are divided into two parts: stripping the top of the limestone to a sufficient distance back to insure four years' production of limestone; and the quarry operations below the bench established by the stripping. Access to the stripping level is afforded by an incline and hoist up which all the equipment was hauled to the bench, upon which a track system has been laid out. Deep cross-ravines have been filled so as to avoid the sharpest curves. Stripping is being done by an Osgood steam shovel (3¼-cu.yd. bucket, No. 73) mounted upon caterpillar tractors. The overburden is loaded into 4-yd. wooden dump cars, which are hauled in trains by 20-ton steam locomotives. Three trains are in operation. The overburden is dumped a short distance to the west of the stripping operations and several dumps are being built out from topographical indentations on the hillside. When these are filled to the limit, additional track extensions to the west will afford other dumping points. At the top of the limestone local depressions that contain sand are cleaned out with scrapers operated by compressed-air tugger hoists, of which three or four are available. Rock drilling is done by hand-held drills at present.

Fuel Oil for Steam Shovels and Locomotives

The locomotives and shovel use oil fuel, which is pumped up to a tank above the stripping level. All of the equipment on this level was used in the previous quarry operations and in the transportation of the limestone to the cement plant. The only new equipment is the caterpillar tractors for the steam shovel. From twenty-five to thirty men are engaged in the stripping work.

On the loading-out level established by the former quarrying, an adit was driven into the limestone on a 0.5 per cent grade and two drifts turned off from this at 60-ft. centers and extended along the principal axis of the deposit. Between the drifts and at an elevation of 30 ft. above the haulage level a series of bulldozing chambers have been cut in the limestone. Each chamber is 80 ft. in length and 50 ft. in width, flat topped, the bottom being hoppered out and connected to six chute-raises, three on each side. From the top of each chamber a raise 10 to 11 ft. square extends to the floor of the quarry. These raises establish the position of the surface glory holes. They are spaced at intervals of 120 ft. along the major axis and the same distance transversely. Six raises have been extended to the quarry level at present and other raises will be extended as they are needed.

In the center of a pillar between two pairs of haulageways a center drift is extended at the same level as the bulldozing chambers. Short connecting crosscuts extend to the bulldozing chambers opposite the chute raises as shown in the idealized sketch (Fig. 1). Subdrifts are on either side of a line of bulldozing chambers, and crosscuts give access to both sides of the bulldozing chambers opposite chute raises.

Pilot Raises Require Some Timber

As a preliminary to extending the transfer raises, a center raise is driven at the intersection of the diagonals between four transfer raises and from this intermediate drives are made at 40-ft. vertical intervals to the axes of the transfer raises. The raises are extended from the intermediates, section by section. A pilot raise 5x5 ft. in section is first put through, and this is slabbed off to the full section, a round being fired in the pilot raise and a round in the slabbing cut below. The broken limestone is drawn down sufficiently to give working room in making the slabbing cuts. Six-foot holes are drilled in raising, a CC11 stoper being used. Four men, working two on each shift, extended a raise 11½x11½ ft. in section 200 ft. in thirty-five days. Timber is used only in driving the pilot raise, and this consists of a few stulls.

A glory hole is started by coning out the top of the raise at an angle of approximately 60 deg. down to the uppermost intermediate. The holes are given a 5-ft. burden and are spaced about 5 ft. apart. The purpose is to break the rock fine at the collar of the raise. This upper cone is established in order to capture as much rock as possible from the benches above, or, in other words, to spread out the drawing effect of the raise over a wide area. During the coning out the broken rock in the raises is drawn down to expose the benches that are cut. When the pit bottom is reached, the quarry face is carried back on a much flatter angle, sufficient, however, to cause the broken rock to gravitate to the bottom.

In breaking the benches above the cone, holes are given a 12-ft. burden and are placed 10 ft. apart. These proportions are approximate, as the quarry face is interrupted by a series of irregular partings that pitch into the face at a fairly steep angle. Holes are drilled to a maximum depth of 20 ft., the maximum steel length being 21 ft. They are sprung once or twice, the first charge being two sticks of 60 per cent dynamite (1-in. cartridges), and the second charge being four sticks. Water is used as stemming. The holes are sprung at noontime, and when the shift returns, they are blown out and 25 lb. of Hercules No. 1 special (in bags) is poured into each hole. A No. 6 electric blasting cap, with 20-ft. lead, is used to explode the charge. The

primer consists of a stick of 60 per cent dynamite placed well down in the bottom of the charge. Dirt is used for stemming. Blasting is done near the end of the shift, and following this all loose rock is barred down. Bulldozing is done on the succeeding shift in the pit bottoms. The boulders are drilled and one stick of 40 per cent powder (1-in. cartridge) with 4-ft. fuse is used for the work. Bulldozing is done in the bulldozing chambers with 40 per cent powder, whenever a large piece of rock appears. Long drills are used for drilling, the driller standing on the shelf at the edge of the chamber and drilling the hole with the long steel from this position. As far as possible he avoids any work on the pile of broken rock except from the vantage points at the sides and ends of the chamber. An eyebolt with a rope attached is placed at each bulldozing crosscut, thus affording additional safety for the men who have occasionally to get on the rock pile. In spite of the bulldozing in the open pits and in the bulldozing chambers, an occasional oversize piece gets to the loading chutes and more or less bulldozing is done at the chute mouth. The final product as loaded into the cars is thus kept well within the limits of the receiving crusher, which is a No. 18 Allis-Chalmers gyratory. The maximum size limit is 60x30 in. Signal whistles operated by compressed air are used as warnings of bulldozing at chutes and within the chambers.

The capacity of the bulldozing chamber, raise and cone is about 100,000 cu.ft., or 5,000 tons, of broken rock. There is thus afforded considerable storage, in addition to the broken rock in the pit. The draw limits of a cone of 60-deg. side slope and 50-ft. altitude is about 60 ft. Thus with a raise spacing of 120-ft. centers and an assumed angle of repose of 45 deg., the hogback between the active areas of the cones will be 60 ft. wide at the base and 25 ft. high above the collar of the cone. The draw with these dimensions becomes active along the entire line of the chutes at an altitude between 20 and 25 ft. above the collar of the cone. As the cone is actually started at greater depth, 70 ft., the line of active draw is nearer to the cone collars than the foregoing estimate indicates.

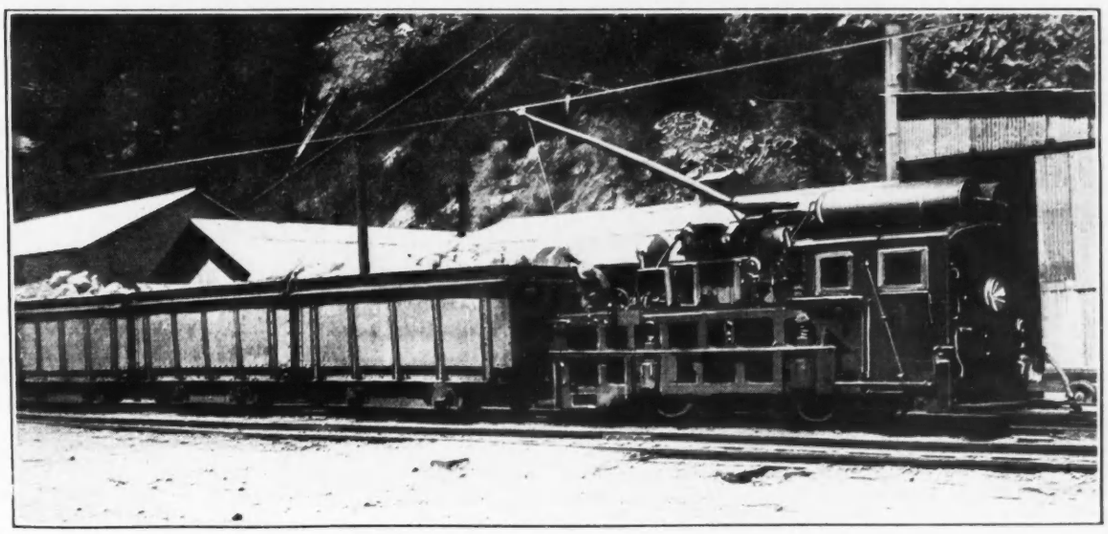
The cones, transfer raises, bulldozing chambers and chute raises are kept full of rock. As the chutes are drawn, the bulldozing chambers receive fresh accessions of broken rock from the transfer raises and these in turn from the cones and open pits. The subsidence is gradual and runs of broken rock in the bulldozing chambers are small and always well under control. The clean broken rock assumes a definite angle of repose, which is distributed at intervals by the undercutting produced by drawing the chutes. This continues until the equilibrium is disturbed sufficiently to cause a run of broken rock from the transfer raises.

It is of interest to note that one of the raises draws from a portion of the pit that contains a good deal of clay mixed with the limestone. The past winter has been a rainy one and the clay contains sufficient moisture to convert it into a sticky, plastic mass. The clay is of advantage in the cement mix, as it contributes to the alumina requirement. As a consequence it is allowed to work down in the pit where it will, and is drawn through the raise. Although sticky clay always causes trouble in raises and chutes, the arrangement in this case takes care of a rock and clay mixture with a high proportion of clay, although it does entail more or less extra labor and occasionally some grief. The clay and rock mixture mushrooms out in the bulldozing chamber, but nevertheless leaves open spaces sufficient to make the chambers accessible. Hangups have not occurred. In fact, in all of the transfers, only one bad hangup has occurred and no trouble has occurred in the wet transfers.

Hangups Not Serious

An important feature of the transfer raise is the intermediates at regular intervals of about 40 ft. vertically; these give access to the transfers and enable a hangup to be reached at a point close to the source of trouble. The usual method of handling a hangup is to tie a powder charge to a lath, 1½x2 in. in section, and introduce it below the hangup and explode it by electric blasting caps. This is repeated until the obstruction is loosened. The generous size of the transfer raise is an important element in securing freedom from hangups. The intermediates are an added insurance that, if trouble occurs, it can be localized and handled without great risk.

The adit is 9x12 ft. in cross-section and the drifts are of the same size, equipped with a single 36-in. gage track, 56-lb. rails. The chute spacing is 30 ft. on one side of the drift along the length of a bulldozing cham-



Train ready for trip to cement plant

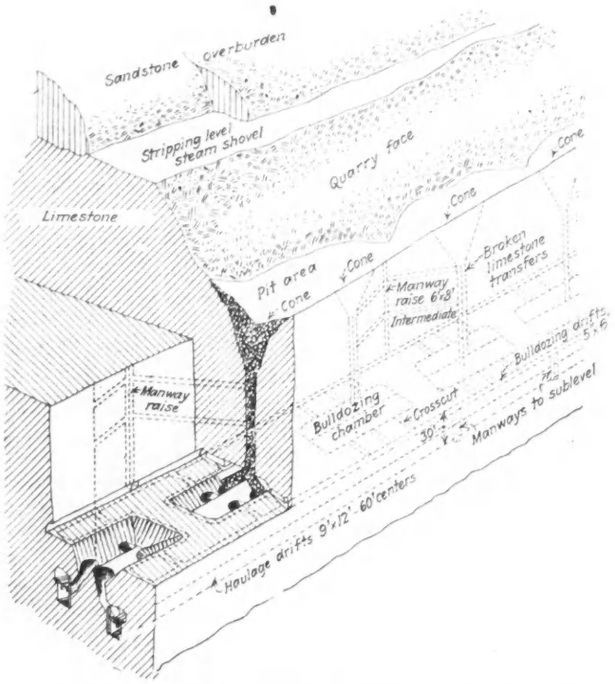


Fig. 1—Idealized sketch of quarry method

ber. The chute raises, 6x8 ft. in section, are extended at an angle of 50 deg. The chute bottoms are at an angle of 37 deg. The chutes are of the underswung arc-gate type modeled after the design used at the Alaska Gastineau. The clear opening is 5 ft. wide. The design is shown in Fig. 2. The cost of the chute is about $750. There are thirty-three chutes available for loading. Sub-level drifts and crosscuts to the bulldozing chambers are 5x6 ft. in dimension. Intermediates are the same and the manway raise to the intermediates 5x8 ft. A water ditch, 3x4 ft. in section, is cut on one side of the adit and follows one of the drifts to a raise that was extended upon an incline and then connected by a shaft from the surface. This shaft, which is lined with concrete, intersects the bottom of the ravine, and the water is carried by a flume to the shaft when its volume exceeds the capacity of the drainage holes or sinks in the limestone. The drainage system was subjected to a severe test during the past winter and functioned satisfactorily.

Jack-hamers, BCR 430, 42 lb. in weight, are used in open pit work and for bulldozing. Cross-bits and $\frac{7}{8}$-in. hexagon drill steel are standard, and air is used to blow out the holes. Starting bits are 2 in. in diameter and finishing bits $1\frac{1}{4}$ in., with 3-ft. steel change and $\frac{1}{8}$-in. gage reduction. For bulldozing, $1\frac{1}{4}$-in. bits are used in drilling. In drifting, Ingersoll-Rand 248 drifters are used and for raising the CC11 has proved to be best suited to the conditions and the workers. Solid steel is used with the stopers. Two compressor stations are in use, one at the portal of the adit and the other on the old quarry level. The first is equipped with two motor-driven compressors, Imperial Type 10, each of 513-cu.ft. capacity, and the second with one Sullivan angle-compound, of 715-cu.ft. capacity. The compressed air requirements total 1,000 to 1,250 cu.ft. per minute. A 6-in. compressed air main is used in the adit with 4-in. branch mains in the drifts and 2-in. branches on the sublevel drifts. In the open pits 3-in. hose connects with manifolds from which the drill hose extends. Six-foot holes are drilled in raising and 11-ft. drills for the cut holes in the 9x12-ft. drifts. In the 5x6-ft. drifts 6-ft. steel is used. The pyramid cut is used in all narrow work. The ground is tough. Two drill-sharpening shops are operated, one at the adit level and the other at the stripping bench. Both are equipped with machine sharpeners, one a Sullivan and the other an Ingersoll-Rand.

In open-pit work the practice is to clean up the top of the bench and work down to the bottom, clearing down all loose rock. The cut is then started at the bottom and worked up. Cleaning and barring down are done after each shot. The holes are placed where they will

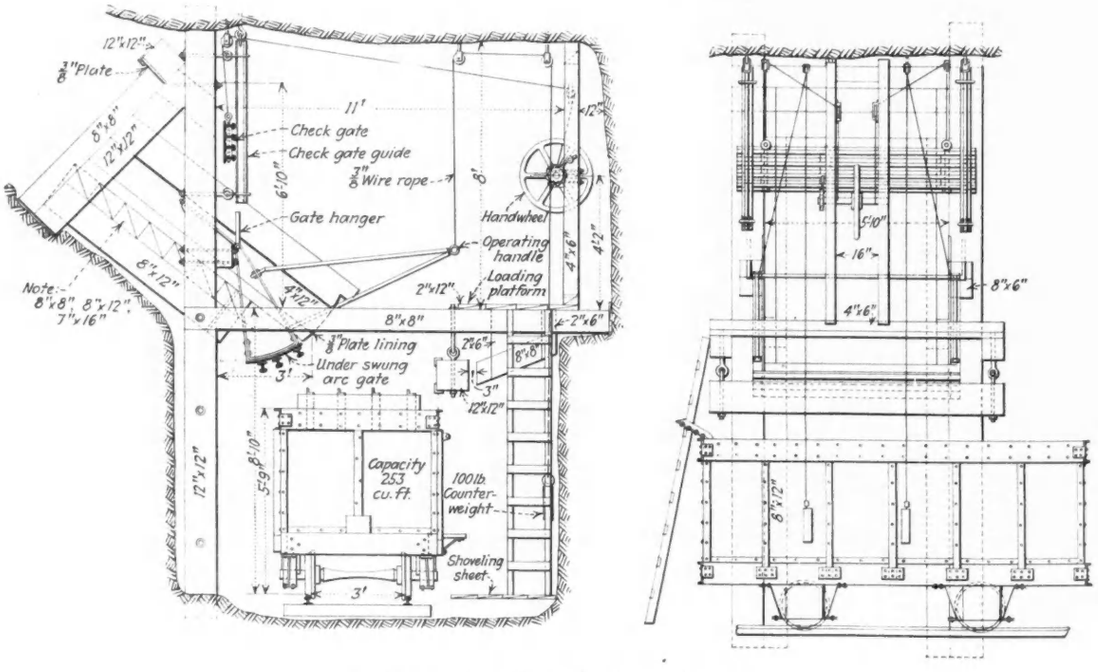


Fig. 2—Details of loading chutes

do the most good. The loose rock and sand are cleared away about each hole by compressed air before drilling is started. Surveys are made each month to determine the amount of loss or gain in broken rock.

TRANSPORTATION BY STORAGE-BATTERY LOCOMOTIVES

The cars have solid bottoms and steel bodies, and are equipped with four wheels, journal bearings and safety couplers. Locomotives and cars are all equipped with air brakes. The cars are 253-cu.ft. capacity and are loaded to 12 tons. The total number in use is sixty-four. An important feature is the use of a steel apron at one end of the car. This prevents any rock from falling between the cars during loading. For handling the cars in the adit, three storage-battery locomotives are provided, two 6-ton and one 5-ton. All are equipped with Exide batteries. For loading purposes, the cars are handled in eight- to ten-car trains, the motor being on the inside with an extra car behind to be dropped where wanted. Each loading crew consists of three loaders, and one blaster in the bulldozing chamber above. One loader accompanies the train to the portal, the two others remaining behind to clean up spill or to blast large rocks at the chute gates. There are two complete crews with a head trammer, and two trains, one for each drift. The chute gates are being equipped with air cylinders and this will dispense with one man on each crew. The storage battery motors make a round trip of 3,000 to 4,500 ft. and can do this in forty-five minutes. The cars are made up in 200-ton trains in the yard at the adit portal. Ten trains are dispatched per day to the cement plant. For this service two trolley-type 18-ton Baldwin Westinghouse locomotives are used. An automatic motor-generator substation supplies current to the trolley line, and a charging unit is available at the adit for the storage battery locomotives. All of the cars are dumped at the cement plant by a revolving tipple operated by compressed air. Tugger hoists are used for supplementary service in handling the cars at the tipple. In addition a wire-rope car-haul is used at the tipple. This is operated by a belt drive from the crusher countershaft. The arrangement of the crusher unit is simple, the tipple discharging directly into an Allis-Chalmers No. 18 crusher and the discharge from each side passing over screens (manganese wire, 2-in. openings) to four No. 6 crushers, and these discharging upon a 36-in. belt conveyor.

In open-pit work eight drillers, four powder men, three nippers, and a boss break the limestone. Development is done on contract. In loading, eight men are required, with a head trammer in charge and two men for bulldozing. This crew loads out 2,000 tons per shift. In the surface transportation, each train crew consists of a locomotive engineer and two men. The total working force is summarized as follows: Stripping, 30 to 35; breaking, 19; loading, 13; miscellaneous, 6; developing, 2; boarding camp, 4; or a total of 74 for the present output of 2,000 tons. The tons per man-shift is 27. The powder ratio in the pits is one pound to 4 or 5 tons of broken rock. The power ratio is 0.6 kw.-hr. per ton for quarrying, loading, and tramming to the train yard.

The layout, method and details of this operation were made by, and the general supervision of quarry operations is under, R. A. Kinzie. L. R. Davis is superintendent in charge of the quarry; W. A. MacDonald is underground foreman, and George Dent is stripping foreman. It is of interest to note that R. A. Kinzie, L. R. Davis and W. R. MacDonald are all from the metal-mining field and all have had experience in handling large tonnages. The courtesy of these men is gladly acknowledged.

Advice for Owners of Talc Deposits From a Cosmetician

"Talcum powder is made of talc alone," says Henry Tetlow in the July issue of *The American Mercury*. "That is, it is magnesium silicate, dug out of the ground in hunks, and then crushed and bolted. It is a dusting or drying powder; it rubs or falls off the skin almost as quickly as it is shaken on. Although an occasional manufacturer may add a little borax and an incantation for the sake of a medicinal talking point, talcum powder has no more effect on the skin than face powder or rouge. Under slight pressure it can be made to rub up a pronounced sheen; its use as a substitute for face powder is thus grossly inadvisable. But the addition of zinc dulls the finish and makes the mixture adherent. Thus talcum becomes a true face powder.

"No perfectly pure magnesium silicate has been discovered anywhere to date. All the deposits now known contain traces of lime and iron; in addition, certain American talcs contain mica. There is only one first-rate deposit of talc in the United States; and that unfortunately runs directly under the Fear River and can be quarried only at a prohibitive cost of pumping. The best talc—from the cosmetician's standpoint—is quarried in Italy. It costs more than either French or American talc, but its freedom from glittering mica particles and its superior whiteness and unctuousness, due to its very small content of iron and lime, make it the only proper talc for cosmetics. The question of talc is here treated in some detail in the hope that it may steer a few of the eighty-odd million Americans who own land containing undeveloped talc mines away from the cosmetics trade. The right market for a low-grade talc is either the rubber goods or the candy trade, both of which use vast quantities of it as an adulterant."

Electrifying Detroit Salt Mine

Plans have been formulated for the electrification of the Detroit Rock Salt Co., Detroit, Mich. Electric motors and control for use in both mine and mill are to be installed. The application of electricity to this mine follows the general policy recently established by the International Salt Co., which is gradually electrifying its various sub-plants, one of which, the Retsof Salt Co., was completed two or three years ago.

Salt will be removed from the mines by a skip hoist, operated by a 600-hp. induction motor. Nine induction motors, ranging in rating from 5 to 75 hp., will drive the tipple, where the salt is cleaned and prepared. Complete electrical equipment, including the necessary switchboard, will be furnished by the General Electric Co. All control for the tipple will be arranged for remote operation, utilizing push-button starting.

An interesting feature of the equipment is the fact that all control devices will be immersed in oil, this being necessary as a result of the very high corrosive action of the salt dust suspended in the air.

When in Doubt Use Treated Timber

By Harry E. Tufft
Washington, D. C.

MINE OPERATORS may draw a useful lesson on the value of timbers maintaining the full strength when subjected to heavy stresses, from the comparative behavior of treated telephone poles and untreated poles in the severe storm that swept the Middle Western States last December. In some areas, telephone lines were almost totally wrecked. In Missouri, Oklahoma, and Texas it is reported[1] that more than 40,000 untreated poles fell, whereas the number of creosoted poles that fell did not total 100. Some of these treated poles that fell were still intact, but were uprooted by the pressure of a tremendous ice load and wind load that exceeded the natural strength of the installation.

Mine operators who have to replace timbers in their mines on account of failure before the timber has served its desired life should observe whether the failed timbers seem to be still practically sound. If they are still sound, they have failed by excessive pressure, and the only recourse is retimbering, using the sizes that experience has shown to be the best suited to the particular mine or district. However, undoubtedly many

Untreated mine timbers, in place only a few months but weakening from decay, installed in heavy ground

failures of mine timber sets ascribed to excessive crushing pressure would not have taken place had not the timber been so weakened by decay that it could no longer carry its normal load. The mine operator should, of course, carefully avoid the use of treated timber in workings where the timbers crush before decay could set in, as, for example, in some parts of the deep copper mines of Butte, in some lead-silver mines of the Coeur d'Alene district and in some deep anthracite workings of the Pennsylvania anthracite region.

Inspection of failed sets may not always show fungus and rotten places, although the timber may be badly weakened by decay. Timber men will usually have a well-sharpened ax or hatchet, and on chopping a failed stick, the stick if partly decayed will usually cut more easily than sound wood. The mine operator in using treated timber should try to make sure that timber is failing from crush and not from decay before he decides that use of treated timber would not be justified in places where timber is not giving the desired service.

The telephone companies may not have reckoned in dollars how much they could save on treated poles surviving hurricanes as one of the major benefits of treatment, but were no doubt aware that strength to survive abnormal load is a function better carried out by sound timbers.

[1] *Wood Preserving News*, Vol. 3, 1925, pp. 33-36.

Factors Affecting Bank Slopes

In discussing the paper of Louis S. Cates on "Factors Affecting Bank Slopes in Steam-Shovel Operations," presented at the New York meeting of the A.I.M.E. in February, 1925, Fred Hellman, of New York, said: "My experience with shovel mining has been restricted almost entirely to Chuquicamata as far as operation is concerned. We had there an unusual condition in that the rock is cohesive because of the salts in it, so that you can probably work higher banks than is possible in most places. Recently they have reduced the height of the banks and have found that lower bank affords better working condition than the higher bank.

"It took two years of experimentation to determine the best height of bank for that particular mine. Each mine should be considered by itself and to state offhand the best height of bank for any given mine is impossible.

"We worked the high banks in Chile without much trouble. We adopted high banks in the beginning in order to obtain the minimum expense in railway approaches at that time. The first plan was for 50 ft.; then to get production started with the smallest expenditure of money, the approach to the deposit was changed and the first bank had an ultimate height of about 180 ft. We worked that bank quite successfully, but I do not think that it could be done anywhere else.

"They could not work those high benches in Panama because of the great amount of lubricating minerals, such as sericite, talc, etc., which cause slides to take place on very low angles. The engineer in charge of the Culebra cut showed me a slide on 11 deg.

"To illustrate the cohesiveness of the rock at Chuquicamata, I may mention some work done possibly before the Spanish invasion in 1545. It was a huge cavern that has been worked down from the top, possibly 100 ft. long by 80 ft. wide and 80 ft. high; spanning that whole opening was a vault of perhaps 12 in. thick that had stood throughout the years. Even our heavy blasting did not shake that down for some time. That gives you an idea of the extraordinary cohesiveness of that rock.

"With sloping banks and tunnel, blasting the tunnels, say, 10 or 15 ft. below the bench, you blow out through the line of least resistance, which is supposed to bisect the angle. Then the top of the bank comes down without any shattering from the blast. The great pieces are sometimes 12 ft. cube; they are difficult to handle with a shovel, and require a great deal of blasting for their breaking."

Cost of Shaft Sinking at Cripple Creek

Total of 502.5 Ft. Sunk for $57.279, Including Timbering and Service Charges

By William Spence Black
Mining Engineer, Boston, Mass.

THE SHAFT-SINKING COSTS, amounting to $57.279 per foot, recorded in this article were secured while deepening the Ajax shaft in the Cripple Creek district of Colorado from the 1,481-ft. to the 1,983.5-ft. point during the early part of the war. The figures are taken from carefully kept accounts and constitute very dependable comparative costs for work of this sort under the conditions stated. Although no claim for a record is made in either the economy of the work or its rate of progress, the results are believed to be above the average.

The shaft was vertical, had three compartments, and was sunk a total advance of 502.5 ft. This advance was made in a period of 293 days of elapsed time, and this includes the time spent on cutting stations and also the time lost by holidays, change Sundays, repairs and other causes. A total of 166 rounds were drilled and blasted in the shaft and the average advance per round was 3.03 ft., but the actual average progress per day of elapsed time was 1.72 ft.

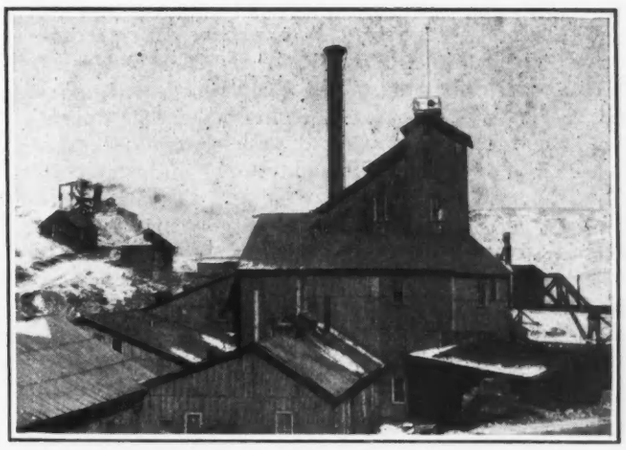
The rock formation was all Pikes Peak granite except where minor veins and phonolite dikes were encountered, but these had no real effect on the costs, and may be disregarded from this standpoint. Pikes Peak granite is pink to red in color; it has various phases, but is generally of medium grain and fairly uniform texture, and is unaltered at depth and hard to drill and break.

Water in the shaft did not have to be contended with, as the ground-water level had been lowered by the Roosevelt drainage tunnel. Consequently, a sinking pump was not necessary and what minor flows occurred were handled by bailing with a sinking bucket. However, the presence of gas in the shaft caused delays and additional expense. The gas was especially troublesome at times of low atmospheric pressure, when it flowed into the shaft from numerous cracks and crevices. "Rock gas" is a regular feature in the Cripple Creek district and in some mines it constitutes a real menace to life. The gas is heavier than air and will collect in shafts and winzes and along the floor of unventilated workings, and in a concentrated state its toxic effect is startlingly sudden and not uncommonly fatal.

The shaft dimensions were 6 ft. 2 in. by 15 ft. outside the timbers. Two of the compartments were used for hoisting, and these were equipped with guides on which ran 1½-ton skips. The third compartment was for ladders and service lines. The shaft timbers were of Mexican pine. The wall plates, end plates, and corner posts were 10x10-in. timbers and the dividers and divider posts 8x10-in. The sets were hung on 6-ft. centers, using ⅞-in. hanging bolts, and the entire shaft, except the sump, was lined with 2-in. lagging.

Two shifts were employed. The drilling, blasting, and timbering were all done on the day shift as far as possible, and the night shift did the mucking and occasionally some timbering. Each shift was made up of four shaftmen, a hoistman, and topmen and skippers as needed. Some consideration was given to employing three shifts instead of two, but as speed was not a special requisite, and as other development work as well as production was on the two-shift basis, it was believed that the mine would function best on a uniform two-shift basis. The mine foreman supervised the day shift and the night shift-boss supervised the night shift, and a proportional part of their time was therefore charged to the shaft work.

Sinking was started at a depth of 1,481 ft. The sump was then 28 ft. below what was called the 1,450 level. An air-driven sinking hoist was set in the station on this level. It was set opposite the manway compartment of the main shaft, and this compartment was used as a sinking compartment. The two main hoisting compartments were bulkheaded three sets below the station and a rectangular wooden tank was assembled on this bulkhead and then another bulkhead was put in above the tank. The tank was used to catch the drip water in the shaft that came from the upper levels, and this water was pumped out by an air-driven pump that was installed in the station. The discharge from the pump was led to an abandoned winze that was in open ground some distance from the shaft, and here the water drained away without any trouble. This arrangement improved the working conditions in the sump, as it reduced the amount of drip water and also the amount of water that had to be handled by bailing, and the expense of the installation was well repaid.



Shaft house and surface plant at Ajax mine
On the sky-line, at the left, may be seen the Portland No. 2 shaft.

The usual V-cut shaft round was used, with forty holes to the normal round and an average drilling footage of 158 ft. per round. Four machine drills were used, all of the jackhammer type. For blasting both 40 and 60 per cent dynamite was used and detonating was done with caps and fuse. It was generally possible to drill and break more ground than the mucking shift could clean up; and as the shovelers were often obliged to work ten-hour shifts in order to complete their work, the depth of the round was made to conform to their

capacity for overtime. Sinking buckets were used to hoist the broken muck, and these were dumped into mine cars over a dumping door at the station. The cars were then pushed over to the hoisting compartments and dumped into the skips and hoisted to the surface. The timbering followed the downward progress of the shaft, but in general the walls stood very well and were easily kept clean, and close timbering was not necessary.

When the shaft had passed well below the position of the 1,600 level, bearing timbers were put in and the shaft was bulkheaded and the new station was cut. The shaft timbering was then finished and the tank and the bulkheads were removed from below the 1,450 level and the guides and ladders were installed to the new level. The sinking hoist was next moved down to the 1,600 level and the bulkheads and water tank were put in below the station and sinking was resumed. This same procedure was followed at the 1,800 level, and subsequently a third station was cut just above water level, at what was known as the 2,000 level.

This work was done in the early years of the World War. This was a period of rising costs, and wages as well as materials were affected. For example, the shaftmen on the day shift were paid $5 per eight-hour shift when the work was first started, and the shaftmen on the night shift, whose work was largely mucking, were paid $4.25 per eight-hour shift. A few months later these rates were raised to $5.25 and $4.50, and later on they were again advanced to $5.50 and $4.75. As there were also corresponding increases in the wages paid to the other members of the crew, it is not possible to state an exact wage scale for the entire shaft-sinking period, but in the accompanying tabulation is given the approximate average wage for each class of labor, and also the rates at which timber and explosives were charged to the shaft account.

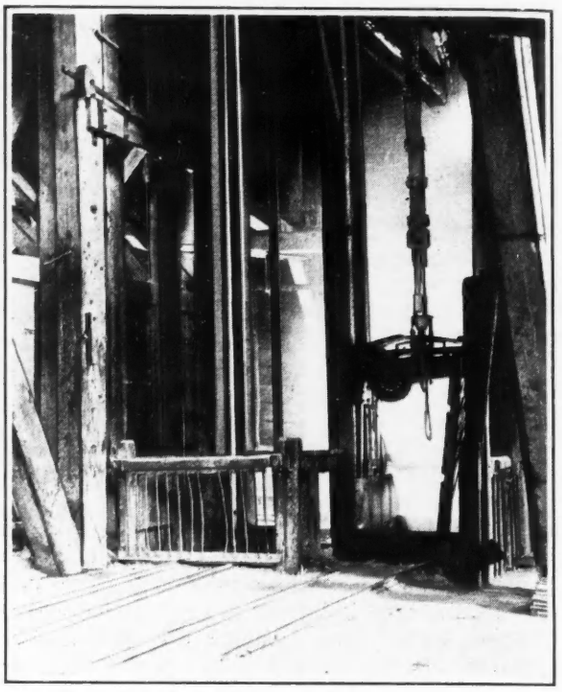
Shaft Sinking Costs—Ajax Mine

Three Compartment—Vertical—Total Advance 502.5 Ft.

Labor Costs	Average Wage	Total Cost	Cost Per Ft.	Per Cent
Machine men	$5.25	$3,271.84	$6.511	11.4
Muckers	4.50	3,251.18	6.470	11.3
Timber men	5.25	2,567.89	5.110	8.9
Sinking hoistman	4.13	1,885.68	3.753	6.6
Shift bosses	5.00	756.67	1.506	2.6
Machinist and blacksmith	4.50	246.79	0.491	0.8
Topmen and skippers	4.00	598.94	1.192	2.1
Pipemen and repairs	4.00	369.58	0.735	1.3
Total labor		$12,948.57	$25.768	45.0
Material Costs				
Dynamite at $19.42 per 100 lb.		$2,020.49	$4.021	7.0
Fuse at $6 per 1,000 ft.		430.28	0.856	1.5
Caps at $1.75 per 100		120.76	0.240	0.4
Timber at $28.33 per 1,000		3,301.70	6.571	11.5
Machine drills (including two new drills)		899.61	1.790	3.1
Pipe		767.68	1.528	2.7
Iron and steel		508.15	1.011	1.8
Miscellaneous		458.41	0.912	1.6
Total material		$8,507.08	$16.929	29.6
Service Charges				
Hoisting waste to surface, 60c. per skip		$2,822.40	$5.617	9.8
Air for machine drills, at $2 per machine shift		1,330.00	2.647	4.6
Air for sinking hoist at $2.50 per shift		1,075.00	2.139	3.7
Sharpening steel, at $0.10 per bit		2,100.41	4.180	7.3
Total service		$7,327.81	$14.582	25.4
Total cost		$28,783.46	$57.279	100.0

Miscellaneous Data on Shaft Sinking

Depth at start, ft.	1481.0	Footage drilled per round	158
Depth at finish, ft.	1983.5	Total pieces of steel used	21,004
Total advance, ft.	502.5	Total buckets of muck	9,346
Elapsed time, days	293	Total machine shifts	665
Number of rounds	166	Total sinking hoist shifts	430
Advance per round, ft.	3.03	Best month's advance, ft.	95
Advance per day, ft.	1.72	Next best month's advance, ft.	85
Average holes per round	40	Poorest month's advance, ft.	11



Collar of Ajax shaft

Flat cables and 1½-ton skips were used for hoisting. The disk attached to the top member of the skip frame is a clock with a movable hand. This is set by the skipper and indicates to the topman the origin of the ore

The rates for service charges were arbitrarily fixed at the amounts stated and the charges were credited to their respective departments. Waste was hoisted from the sinking station to the surface at a charge of 60c. per skip of 1½ tons, and this charge was credited to the hoisting department. The air used by the machine drills was charged at the rate of $2 per machine shift and the air for the sinking hoist and pump at $2.50 per shift, and these charges were credited to the air-compressing account. The sharpening of drill steel was charged at the rate of 10c. per bit, and the blacksmith shop account received a credit for an equal amount. Similar charges were made against all the underground workings, and that the rates were fair is demonstrated by the fact that the cost of operation of each service department was generally balanced by the credits received for service furnished.

Fluctuations occurred from month to month, but the final results were, in general, balanced. Somewhat higher service charges would have been necessary if the other departments of the mine had not been in operation, and it is proper to indicate the extent of this other work, which totaled 2,600 ft. of lateral development and the hoisting of 11,000 tons of newly developed ore, all this being done during the shaft-sinking period. It should also be noted that these costs do not include charges for supervision and office expense.

Mica Production In 1924

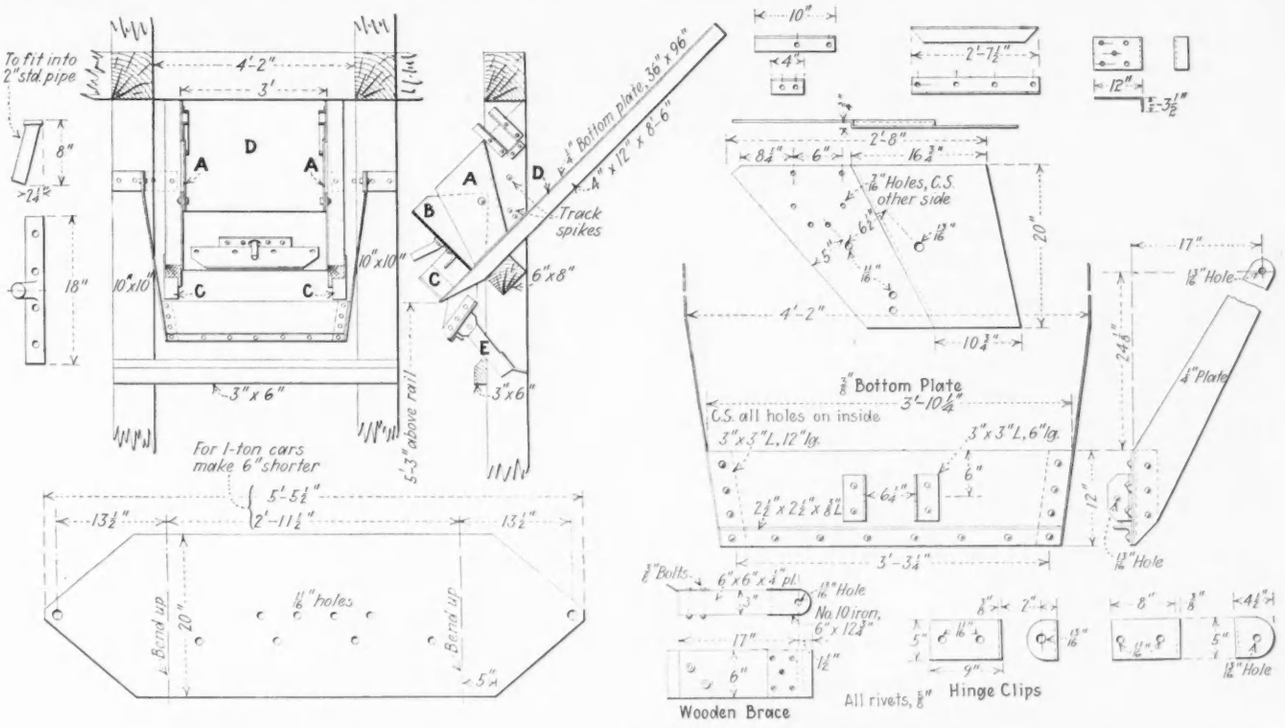
The total quantity and value of domestic uncut mica sold by producers in the United States in 1924, as reported by the Bureau of Mines, was 5,439 short tons, valued at $299,277. Of this quantity 730 tons (1,460,897 lb.), valued at $212,035, was sheet mica; the rest was scrap mica.

Useful Operating Ideas

Chute Gate Construction

The accompanying illustration shows a type of chute gate construction developed by the mining staff and in use at the mines of the Calumet & Arizona Mining Co., at Warren, Ariz. The bottom and sides of the chute are of 4-in. plank. Two $\frac{5}{16}$-in. right and left cheek plates *A* form the sides of the chute. These are bent in order to give clearance to the overswung gate *B*. In addition, they are provided with two side pockets for the insertion of a check board. The gate *B* is 20 in. in height and is formed of a single piece of $\frac{1}{4}$-in. plate bent at either end to form a U-shaped section. The front of the gate is stiffened with a 4x4x$\frac{3}{8}$-in. angle and a cast-iron prong 8 in. long is riveted to the front of the gate above the stiffening angle. An angle *C* is provided on either side of the lowest side board to hold a spill board to prevent fines from working down when the chute is not in use. An outward swinging chute lip is suspended from brackets on either side of the chute and when in use is supported by a short prop *E* which rests upon a beveled 3x6-in. cross-timber. The prop is kicked out when the lip is not in use, allowing it to swing under the chute lip. The bottom of the chute is protected by a $\frac{1}{4}$-in. bottom plate 36x96 in. The side boards of the chute extend down on either side of the bottom boards and are supported on a 6x8-in. cross-piece, as are also the bottom boards. The clearance of the chute lip when not in use is 12 in. The opening of the chute is 3 ft. and the height above rail is 5 ft. 3 in. The gate is operated by a short length of 2-in. pipe, which is thrust upon the prong. Two sizes of gate are in use. The construction is such that the gates can be used at square sets or as drift timbers. The chute can be dismantled and the metal parts reused. It is spill proof and leakproof, and hand accidents are avoided.

The blueprints from which the accompanying illustration was prepared were kindly loaned by the Calumet & Arizona company.



Details of chute gate construction as developed by Calumet & Arizona Mining Co.

Use of Stemming in Drill Holes

In certain metal mines in which the drilling costs were high, it was observed, according to *The Detonator*, that the drill holes were filled with explosive. Blasting caps were placed in the last cartridge near the collar of the hole on the theory that the initial detonation of this portion of the charge acted as an effective stemming to the remainder of the charge. A careful check of this method demonstrated that results did not compare favorably with the more recent practice of leaving out a couple of cartridges and replacing them with well-tamped stemming of moist clay. Following the latter procedure, not only was greater energy developed and a saving in explosives outlay effected, but missed shots due to primers being cut off at the collar, or thrown out by the explosion of previous holes, were almost entirely eliminated. Furthermore, the presence of noxious gases was noticeably less.

Guide Sheaves for Hoisting Ropes

An interesting type of guide sheave is in use at the main shaft of the Empire mine, Grass Valley, Calif. The headframe gives a vertical height of 100 ft. above the center line of the hoist. The hoist is placed 134 ft. horizontally from the vertical center line of the head sheaves. The double drum hoist is equipped with 6-ft. drums, 60-in. faces, and the inside flanges of the drums are 3 ft. apart, making the centers of the drums 8 ft. apart. The included angle between the extremes of rope position on a single drum and the corresponding head sheave is slightly less than 2 deg. The head sheaves are 6 ft. in diameter and are 44 in. apart.

Guide sheaves were placed between the hoisting drums and the headframes at a point 40 ft. in advance of the drum center and 94 ft. from the vertical passing through the center of the head sheaves. The guide sheaves are 3.75 ft. in diameter. Each is keyed to a shaft that is 9.5 ft. in length and that is terminated at each end by collars that permit of the shaft sliding longitudinally in its bearings. The longitudinal play between the boxes is slightly more than 4 ft. The extreme positions of the guide sheave between the bearings is thus controlled within this limit of travel of 4 ft. The journal boxes of the guide sheaves are supported upon cradles that are pivoted at the center and swing on the pivots as the guide sheave travels from side to side. With the hoisting rope at the center of the drum, the guide sheave is in the vertical plane and the guide sheave shaft is in the horizontal position. Both cradles and guide sheave shafts are normal to the line of the rope. To prevent any possible whipping of the hoisting rope out of the guide sheave, a wooden guard extends across the cradle above the guide sheave and is sufficiently close to the flanges of the groove in the wheel to prevent the rope from escaping.

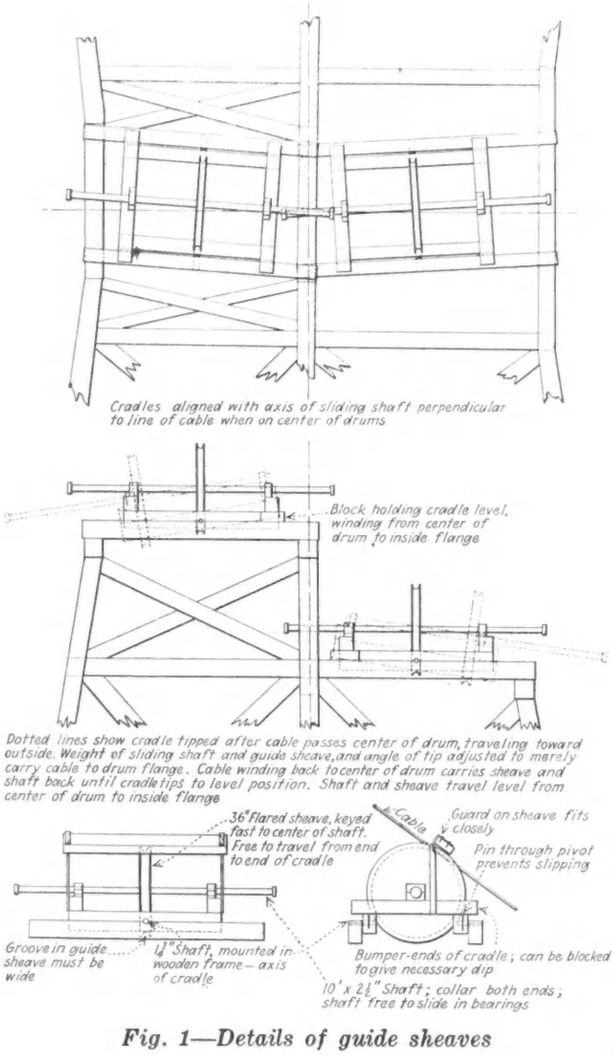

Cradles aligned with axis of sliding shaft perpendicular to line of cable when on center of drums
Block holding cradle level, winding from center of drum to inside flange
Dotted lines show cradle tipped after cable passes center of drum, traveling toward outside. Weight of sliding shaft and guide sheave, and angle of tip adjusted to merely carry cable to drum flange. Cable winding back to center of drum carries sheave and shaft back until cradle tips to level position. Shaft and sheave travel level from center of drum to inside flange
36" Flared sheave, keyed fast to center of shaft. Free to travel from end to end of cradle
Cable
Guard on sheave fits closely
Pin through pivot prevents slipping
Groove in guide sheave must be wide
1¼" Shaft, mounted in wooden frame—axis of cradle
Bumper-ends of cradle; can be blocked to give necessary dip
10' x 2¼" Shaft; collar both ends; shaft free to slide in bearings

Fig. 1—Details of guide sheaves

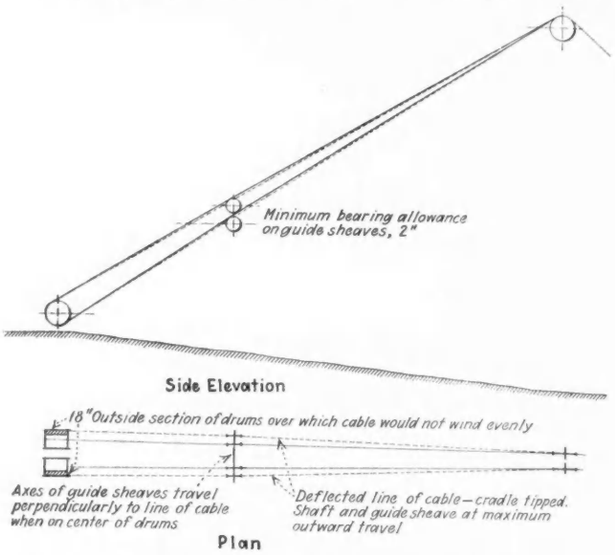

Minimum bearing allowance on guide sheaves, 2"
Side Elevation
18" Outside section of drums over which cable would not wind evenly
Axes of guide sheaves travel perpendicularly to line of cable when on center of drums
Deflected line of cable—cradle tipped. Shaft and guide sheave at maximum outward travel
Plan

Fig. 2—Relation of head sheaves, guide sheaves and hoist

Before the use of the guide sheaves the hoisting cable, which is wrapped about the drum in several layers, refused to cover the 18 in. of drum-width next to the outside flange of the drum. This resulted in an objectionable piling up of the rope upon the drum. The guide sheaves overcame the difficulty, and their use has resulted in the even winding of the rope upon the drum.

Track Hooks for Spoil Cars

To prevent side-dumping cars from going over the dump, as occurs with certain types of light cars, short chains with attached hooks are provided that are fastened to the ties at regular intervals. When a train is in place ready for dumping, the hooks are attached to the car frames and prevent the overturning of the car. A similar device is applicable at a mine dump. The hook is attached to a short length of wire rope anchored to the ties. The length of rope is sufficient to allow the body of the car to assume the proper dumping position, but will prevent overturning. The arrangement is used in lime kilns where the cars are dumped directly into the kilns.

Handling Clay in Crushers

Sticky clay interferes with the regular operation of rock crushers and entails extra labor to work the clayey material through the crusher. At cement mills the difficulty is partly overcome by sprinkling fine dry mix in the throat of the crusher before the clayey material is fed. This prevents sticking, on the same principle that prevents dough from sticking when it is coated with dry flour. Fine tailings will answer the purpose in crushing plants.

Discussion

Underground Mechanical Loading

THE EDITOR:

Sir—Your editorial "Underground Mechanical Loading" in the issue of Aug. 1 will undoubtedly suggest some observations to both manufacturers and users of mechanical muckers, and will confirm a quite general misconception now in the minds of many mining operators. Mr. Van Barneveld's treatise is unquestionably a thorough and distinct contribution to the literature in this branch of equipment. But the conclusion drawn in your editorial is an unwarranted deduction from his book and most certainly not justified from experience in hard-rock work.

You state, "The successful underground mucking machine will have to . . . be light, portable and efficient." Of course it will have to be efficient. But a light, portable mucking machine is the will o' the wisp that has lured many an inventor and his financial backers into the bog of financial disaster, and these successive and foredoomed failures have greatly injured the advancement of an important phase of mining operation.

The work a mechanical mucker is called upon to do in a 7x7 (or larger) tunnel, drift, or crosscut is of course very severe. The machine should be able to muck the heading in three hours in order that a full cycle of mucking, drilling, and blasting can be accomplished in each eight-hour shift. To do this, the machines must be fast and powerful. The muck pile, made up of varying sizes of rock, often on a rough bottom, presents a resistance that shocks any machine operating at the necessary speed. Unless the machine is very strong, its life is short and full of trouble. It simply pounds itself to pieces. There is no known method to obtain the strength and rigidity that must be combined in so small a machine, except by making it entirely of steel castings. Add to this initial requirement the power units, and the hope of a light, portable underground loader vanishes. Anyone that has ever studied the problem and watched a mechanical mucker, backed with 90 lb. of air pressure, tearing into a muck pile, being abused by operators, being blasted on and caved on and rammed into by heavy strings of cars, would conclude that it is truck horse and not race horse work. Our experience, drawn from the study of scores of machines, hundreds of jobs, and the driving of more than a mile and a half of tunnel as a "laboratory test," convinces us that efficiency, strength, and rigidity are inseparable from weight.

The mining operators are recognizing this truth and today mechanical shovels weighing more than 6,000 lb. are displacing hand labor in the mines, not only of the United States and Canada, but in the cheap labor countries of South Africa, South America, Mexico, and Japan.

My point is that the trade journals should not be forever holding out to the operators the vision of a nonexistent and impossible product, but should encourage the use, experimentation, and development of those now being successfully produced.

Duluth, Minn. HUBERT H. D'AUTREMONT.

Living and Operating Expenses in Mexico

THE EDITOR:

Sir—It is needless to state that both your editorial of May 9 and Mr. Benson's letter of June 20 were eagerly read by the *Mining Journal-Press* subscribers here. After a fourteen-year residence in the states of Puebla and Hidalgo, as well as in the Federal district, I fail to agree with Mr. Benson in his belief that your quoted figures are in general rather too low than too high. Primarily it should be noted that the present American population of Mexico City not at all representative, economically, of a home town. When I first arrived in the country at the beginning of the revolution, there were many classes here instead of the few groups—company executives, sales managers, realtors, missionaries, professionals, and clerks—which now form the residual small American population. For instance, in 1911 the executives and skilled operatives on the bulk of railway mileage were Americans, but the latter were eliminated in the strike of 1912 and the former on the climb to power of the anti-foreign Carranza in 1914. During this same period of increasing anarchy, the gradual shutdown of American mines, ranches, and factories turned thousands of their artisans and clerks back to Dixie, along with many of the same economic class in the cities, such as merchants and professionals, who had depended on a numerous resident American clientèle for a living.

In the light of these facts, the estimated annual living cost for a family of four of $5,800 by the Department of Commerce and of $6,888 by the American Chamber of Commerce here (presumably pesos and not dollars) is absurd as an average figure, for it can apply only to that richer class of Americans that have survived the economic disaster of the revolution.

Equally unrepresentative, and for the same reasons, are the figures of average salary, calculated by the local chamber for a bachelor at $3,900 and for a married man at $6,200. On the same basis of representation, "averages" could be selected for any big American city at several times these sums. To paraphrase a modern proverb, Figures don't lie, but triflers will figure.

All this does not mean that living costs have not advanced here since 1914, for the local estimate of a 62 per cent rise in the cost of foods appears close to the truth. As to clothing, I have noticed no marked general advance beyond that of the United States. Even in 1914 most cotton goods, as underwear, overalls, and sheeting, were much dearer here as a result of the high tariff-wall erected long before by Limantour. On the other hand, made-up woolens were often much cheaper on account of cheaper tailors; and this difference in favor of Mexico has since been augmented as a result of the increase in wages paid to American clothing workers during the boom of the World War. Lastly, considering house rent, I think the tendency has rather been downward except in a few localities such as the Federal district. In the latter there has been more than a 50 per cent increase in population since 1914, preponderantly of the upper class, who flocked here by thousands to avail themselves of its superior police

protection, when their homes were overrun by the revolutionary guerrillas.

Speaking generally, I believe that family living costs here compare favorably with those of the United States. Even in Mexico City they are probably no higher than in Washington or New York City. A special advantage in the case of large families of children is the moderate wages of domestic servants (mostly rural Indians) as compared with those of American cities, where, since the World War, they have become a luxury restricted to the rich. Moreover many American housewives here, as in the Philippines and other sub-tropical countries with different eating and housing customs from the homeland, refuse to modify their menage in the slightest in harmony with their changed surroundings. With such cheap and luscious native fruits (unknown to the temperate zone because unsuited for distant shipment) as zapotes, papayas, chirimoyas and guayaves they have no acquaintance, but persist in buying canned goods of peaches, pears or apples imported from the United States at great expense. They will not eat the excellent native oranges, but must have the seedless Californians; they can't stomach native butter or lard, so must buy that prepared in the Chicago packing houses. In spite of the high tariff-wall against American-made furniture or clothing, they can use no other, though local carpenters can make beautiful pieces out of native hardwoods and local tailors can fabricate tastefully the finest fabrics imported from England or France.

The increased cost of mine operating in Mexico is a problem distinct from domestic living, and perhaps Mr. Benson takes none too gloomy an outlook. While the chief metal output, silver, has gone up by only one-third in price since 1914, the increase in costs at many mines has been double that. In the case of several Pachuca companies, with ore of good grade, the outlook is not so bad as for numerous lean mines, like those of Guanajuato, whose small working margin of 1914 has now taken a minus sign. Whereas some of the increased costs are due to world-wide causes, others proceed from the destruction of productive capital by the revolution or from ill-considered attempts at social reform the main effect of which to date has been to create new privileged classes further to burden instead of to help the toiling masses. In the past half-year, however, there has begun a hopeful change in policy; not only have thousands of parasitic bureaucrats been severed from the national government's payroll but a decisive stand has been taken against the extortionate wages and superfluous operatives that have disgraced the public administration of the National Railways since 1920. With the new reduced wage scale and the elimination of 4,000 drones, which took place in May, there has been inaugurated a new business, instead of political, managing basis, and a general lowering of the excessive freight rates, which now so burden primary industries like mining, has been promised for Sept. 1.

Mexico City, Mexico. ROBERT BRUCE BRINSMADE.

The Old-Time Prospector

THE EDITOR:

Sir—From time to time I have read what amounts to a plea for the retention of the "old-time prospector" in the organization chart of the mining industry. His retention means in most instances a continuance of grub-staking. Is this practice the most economical way of discovering mineral deposits? We should not look on the "old-time prospector" as a picturesque personality and retain him solely because his career in the past gave to mining a touch of its romance. We must not draw a mental picture in which he appears plodding after a patient burro and one day uncovering a bonanza, the proceeds from which will enrich us beyond our fondest dreams. The "old-time prospector" at one time filled a real need. He is a man worthy of respect. His voluntary retirement from the creature comforts of civilization, his unfailing optimism, his hard work, all prove him to be of high courage and of sterling worth as a man. But although his grub-stakers get a good run for their money, do they, under present-day conditions, get the best run? In addition to moral and physical courage, the prospector should have a sound knowledge of several branches of science. He must have back of him sufficient funds, or it is practically inevitable that the few hundred dollars placed to his credit will be lost. A deposit has to be phenomenally rich before it can be started on a shoestring. I dare say the big majority of the mines nowadays that are paying dividends are not of the bonanza type, but huge low-grade deposits that have demanded great financial resources and high technical skill to place them in the happy position in which we find them. A prospector backed by a few merchants or private individuals of relatively small means may come across such a deposit. What can he and his supporters do with it? It isn't so easy to interest capital, which perhaps is not altogether a bad thing. Financial houses are not eager to send engineers to report on every proposition submitted to them. Therefore, all things considered, it seems that the best plan is to let the "old-time prospector" go and replace him by the trained scouts of well-financed exploration and development companies. Man is at heart a gambler, not averse to taking a chance. I am not denying him his right to spend his money as he chooses, but merely wondering what kind of investment is in the long run best for the mining industry. PAUL T. BRUHL.

Rosario, Honduras.

Consultation

Transportation in Interior Africa

"I have read that the Rhodesia Congo Border Concession has for prospecting a territory larger than the State of New York. Can you tell me how men and equipment are transported in this vast undeveloped region in the heart of Africa?"

Through the courtesy of Raymond Brooks, the American engineer in charge of operations on the concession, we are able to give the following notes:

The bulk of material that has to be transported through tse-tse fly country is carried by natives. The legal load for natives is 60 lb., or 100 lb. for two carriers on the same load. It costs approximately 1s. per day per native for his wages and food, and the average distance he will carry a load continuously is about sixteen miles per day. For trips of one or two days he may do twenty miles a day. This is equivalent to approximately 2s. per ton-mile.

Where there are no tse-tse, oxen are best and cheapest. A fairly low cost for ox transport, done on contract, is 30s. per ton for a haul of thirty miles, or 1s. per ton-mile. The contractor cuts out his own rough road if the tonnage warrants, and furnishes everything except labor to load and unload wagons. From four-

teen to twenty oxen are used in each team, and the capacity of the wagons is about 5 tons. The cost of ox transport would average about 1s. 6d. per ton-mile. If there is danger of cattle being fly struck, it is customary to agree to purchase such cattle from the contractor at from £5 10s. to £7 10s. per head. Cattle infected by tse-tse fly will live only about three or four weeks, and sometimes much less. Up to the time they become too weak to stand they are still satisfactory meat for natives, and also for whites, except that the meat is dry and there is very little marrow in the bones.

The R. C. B. C. is doing no transport with heavy motor lorries at present. The direct expense for motor transport with lorries of 3½- to 5-ton capacity is not much greater than ox transport, but the indirect expense for upkeep of roads, bridges, etc., is excessive.

Motor roads in this country, which is quite thickly timbered, cost £10 per mile to construct, without any surface dressing of any kind. Stumps are taken out to a depth of 6 in. below the natural surface and the hole is tamped with earth. The grass and brush are "scuffled" off with hoes and occasional side drains put in at low points. Roads are made 10 ft. wide. For the first two years the new growth of grass and weeds should be scuffled off in November and again in April. After that, if there is fairly constant use of the road, the grass is easily kept down.

The soil of the country is mostly clay, with varying amounts of sand. Surface iron stone (the so-called "laterite" of Africa) is very abundant and sometimes can be followed for short distances. This iron gravel can usually be found at a few feet depth near the road, and where heavy, or much fast traffic is necessary, is an ideal material with which to "metal" the tracks, or the entire road.

The ordinary clay surface serves very well for ordinary travel with cars up to 6,000 lb. total weight, but soon wears out with heavy loads or fast travel.

The headquarters of the company are eighty-five miles from Ndola, the nearest post office and British railway point. A 1½-ton Graham Bros. lorry is used between these two points. It makes a round trip once a week, taking the European mail to Ndola and returning with mail, passengers, parcels, European foods, and any urgent material. The trip, one way, is done in six hours and the petrol consumption, with a load of 2,200 lb., is about 7 gal. A Ford car, converted into a 600-lb. capacity lorry, formerly did the same work. The Ford is still in commission on other work, but is requiring a great many repairs, and was using more than 7 gal. of petrol per trip. The Ford has done a total of 22,000 miles in two years.

The principal object in building motor roads in the concession is to permit Mr. Brooks to get about to different centers without undue loss of time. The company has built 275 miles of motor roads in the past twenty-four months and is now co-operating with the local government in building two hundred miles more to reach some of the districts further west.

Mr. Brooks drives a Dodge touring car of late design. Balloon tires have been added and are a wonderful thing for these roads. He drives the eighty-five miles to Ndola in four hours without abuse of the car or road, and this includes crossing the Kafue River on a pontoon.

In 1921 the company transported 662 metric tons of material and supplies a distance of forty-two miles, crossing the Lualaba River on a pontoon at the midway point. The costs by different methods in ton- (2,000 lb.) miles follow:

	Cost Per Ton Mile
F.W.D. lorry	$1.03
Holt tractor	1.76
Fiat lorry (5-ton) operated on contract	.54
Ox wagons (contract)	.63
Carriers:	
Company account, with load 50 lb. per boy	1.52
Contract, with load of 80 lb. per boy	.51
Contract, with load of 50 lb. per boy	1.30

A few explanations are required on the above. Ox transport was possible only for twenty miles, up a moderate grade and through sand.

The Fiats were operated twenty-two miles from the railway to the point where the oxen took the loads. The road was in good condition when they started, but later became badly rutted. The contractor lost money.

The Holt tractor was operated on only two trips. The chief trouble with it was that repairs are difficult to make when it cannot reach a base every day. When the rains come on, it had to have "mud hooks," which cut the road badly.

The first carrier transport above at 51c. per ton-mile was done on contract with a man who, it turned out afterward, did not feed his boys properly or pay them. The legal load at the time was 40 kg., whereas the law was changed soon afterward and the other carrier transport was based on 25-kg. loads.

Traction engines have been tried throughout this country and were not very satisfactory for long hauls. Their water consumption is a serious obstacle.

All mechanical and ox transport is more expensive in the rainy season than in the dry season, though the motors naturally suffer much more than oxen through depending on their own traction in soft places. It is advisable, and sometimes necessary, to do all heavy transport in the dry season, between May and December.

A motor transport vehicle for this country should not have a capacity of more than 3½ tons and should be equipped with giant pneumatic tires. The tread, or gage, should be the same as for touring cars, and the same in front and back. The F. W. D. had faults of construction that caused delays and expense, but the four-wheel drive is good, and the fact that the front and rear wheels are the same size and track is a great advantage. On the F. W. D. above, a change was made to giant pneumatic tires after time was wasted with solid tires. After that there was no tire or road trouble. Four tires were inflated when new in July, and after doing 6,000 miles were still in serviceable condition. They were never inflated again during that period of ten months and the spare was never used. They were Goodyear tires, and proved to be the most important single item in solving motor transport problems in South-Central Africa.

German Potash-Mining Companies

"Would you be kind enough to give me the names and addresses of German potash-mining companies?"

The German Consulate-General informs us that there are several hundred potash-mining companies and to compile a list would take three or four hours, though they are on file at his office, at 42 Broadway, New York City. Most of the companies, however, belong to the Deutsches Kalisyndikat, G.m.b.H., Berlin-S.W. 11, Dessauerstrasse 28, which is represented in New York by the Potash Importing Corporation of America, 81 Fulton St.

News of the Week

The Mining News of ENGINEERING AND MINING JOURNAL-PRESS is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

Summary

SUBSIDY granted coal operators in England. Strike averted, but troubles not settled. England losing export coal trade.

Research by government bureaus should advance knowledge and at same time be an aid in industrial improvement.

Calumet & Hecla's new underground haulageway on Eighty-first level near completion. Will enable company to increase mining depth 2,000 ft.

Increased price of lead encouraging prospecting and development work in southeast Missouri.

A new mining association formed at Boise, Idaho, for stimulating the mining industry.

First meeting of Bureau of Mines advisory committee. Officers elected. Next meeting in Salt Lake City.

Stripping of Scranton mine completed; 5,000,000 cu.yd. earth removed in three years.

Reorganization of Seneca Copper Corporation makes possible the resumption of Seneca mines.

Possible development of iron ore deposits in Durango, Mexico, where there have been repeated failures.

McIntyre mine in Ontario produces $300,000 per month. Gross production to date $22,000,000.

DeBeers diamond control to pass to a newly organized syndicate Dec. 31, 1925.

Calumet & Hecla's New Underground Haulageway Near Completion

Calumet & Hecla Consolidated's haulageway on the eighty-first level of the conglomerate department is about ready for use, but its advantages will not be fully in evidence until the ground above tributary to the several shafts is mined. According to the estimates of the company's engineers, the life of the shafts above the haulage tunnel is approximately fourteen years, based on an annual production of 900,000 tons of rock. When the shafts are exhausted, the haulageway will be an important factor in the mining of the conglomerate lode below the eighty-first level. It will sufficiently reduce costs to permit of the opening of the vein to a depth of 2,000 ft. below the tunnel, thus assuring a long life for the conglomerate department. This is equivalent to a depth of more than 10,000 ft. on an incline from surface. The rock will be hoisted to the haulageway and trammed to the Red Jacket shaft, which will be used exclusively for hoisting. No. 7 shaft, Hecla branch, is the only shaft now opening the lode below the haulage level. It has reached the eighty-seventh level and is developing ground in both directions. The haulageway will be used for the transportation of rock from this shaft at depth to the Red Jacket. Operations in No. 7 below the eighty-first have been confined to date to drifting, no stoping having yet been started. Thus it will be seen that large reserves have been added, and life of mine extended.

McIntyre Mine Production $300,000 per Month

OFFICIAL ESTIMATES place the value of the gold produced by the McIntyre Porcupine mine of northern Ontario and the value of the gold in the present ore reserves at a total amount of $34,000,000. From the commencement of operations in 1912 until June 30 of the present year the McIntyre has handled more than 2,300,000 tons of ore carrying an average of $9.50 per ton. The gross yield was approximately $22,000,000 including the last fiscal year ended June 30. The company handled an average of from 1,000 to 1,200 tons of ore daily recovering gold at the rate of approximately $300,000 per month.

Fire Destroys Warehouse of International Nickel Co.

The large machinery storehouse of the International Nickel Co. at the smelter at Copper Cliff, in the Sudbury district of northern Ontario, was totally destroyed by fire on Aug. 7. The loss is estimated at more than $150,000. The fire is supposed to have been caused by an explosion of oils or gasoline stored in the building. The efforts of the Copper Cliff Fire Department and the company's employees prevented the flames from spreading to the other buildings of the plant.

Seneca Copper Corporation Sold at Receivers' Sale

The property and assets of the Seneca Copper Corporation were sold to the Seneca Copper Mining Co. for $947,762 at a receivers' sale at Eagle River, Mich., Aug. 5. The sale was made according to the plan of reorganization agreed to and approved by the U. S. District Court for the Southern District of New York and the District Court for the Western District of Michigan. Concluding formalities before resumption of operations will be formal approval of the sale and an accounting by the receivers.

Physically, Seneca is in splendid condition. Both shafts have been kept free of water, and various levels are ready for stoping. All openings are in commercial ground, with the best showing in the bottom levels. The seventh level in Seneca shaft, the deepest opening, is heavily charged with copper its entire length of 1,300 ft. from the Ahmeek boundary, which is considered significant of what may be expected in the way of values at greater depth. The third, fourth, fifth, and sixth level drifts from Seneca shaft are long and consistently mineralized. The copper content of the Kearsarge lode on the Gratiot side of the property is as encouraging as on the Seneca side. The shaft has been holed through from the sixteenth level to the third level Seneca drift, approximately 1,100 ft. The shaft remains to be completed and concreted for that distance, but the connection provides ventilation for the long drifts from Seneca shaft.

Miami Concentrator Being Enlarged

Improvements in the Miami Copper Co.'s concentrator are expected to be completed in the near future. The crushing arrangement has been altered to take care of approximately 10,000 tons a day, instead of 7,500 as formerly, and also to meet the requirement of the increased hardness of the lower-grade material that the company will be forced to treat. Two pairs of 78-in. finishing rolls, having a 42-ton base, 8-ft. solid flywheels, with 7½-in. shells, driven by 150-hp., 150-r.p.m. induction motors with automatic controls, built by the Traylor Engineering Co. of Allentown, Pa., have been added to the present crushing plant. These will add a new crushing stage and reduce the mill feed from the present size of ⅝ in. to ¾ in. Heretofore the ore has been crushed to a ⅝-in. size, in two stages employing gyratories and rolls, the latter being in closed circuit with the ¾-in. screens. The reduction in the ball mill feed from ⅝-in. to ¾-in. size will give these mills an increased capacity and allow a greater tonnage per unit to be treated.

Three new De Laval centrifugal blowers, each of 20,000 cu.ft. capacity per minute, have been installed to replace the old smaller blowers and to give the increased capacity needed. They are driven by individual 325-kva., 750-r.p.m. synchronous motors, direct connected through speed-increasing gears, which speed the blowers up to 3,300 r.p.m. These blowers supply air at 4¾ lb. per square inch gage. They were manufactured by the De Laval Steam Turbine Co. at Trenton, N. J.

The Miami metallurgists have been endeavoring for some time to improve the grade of Miami's concentrates by dropping some of the barren pyrite and experimenting with selective flotation.

Silver-Lead at Trona, Calif.

A new property, the Ophir mine, that promises to become of importance has been opened up by J. W. Kelly of Los Angeles. The company, known as the Engineers Exploration Co., is privately controlled and consists of J. W. Kelly, Edith F. Coons, M. Norden, U. F. Harwood, and John M. Fox. The property is a lead carbonate deposit, a short distance from Trona, Calif. Seventeen cars of ore has been shipped in four months. The ore is "sand carbonate" down to the 200-ft. level, the carbonates averaging about $4 per ton in silver. Galena ore opened up on the 400-ft. level assays as high as 180 oz. of silver per ton. The present length of the ore shoot is 400 ft., according to J. W. Kelly.

Grass Valley, Calif., Active

The Hermitage Mining Association has been formed to develop the mineral possibilities of the Hermitage ranch, three miles south of Grass Valley. H. Williams and C. Briggs, who have bonded the property, have secured associates to finance their operations. The Midas mine, west of Grass Valley, is to be reopened by H. Snyder and his associates. Pumping is being continued at the Idaho-Maryland and Newtown mines pending completion of financing. The Brunswick mill is being operated on two shifts per day in place of one.

California Zinc Co. Shipping 1,500 Tons Per Month

The California Zinc Co. is shipping to Belgium a carload of zinc concentrates per day from its plant at Winthrop. The cars average between 40 and 50 tons. Three hundred men are employed by the company, making the largest mine payroll in the county.

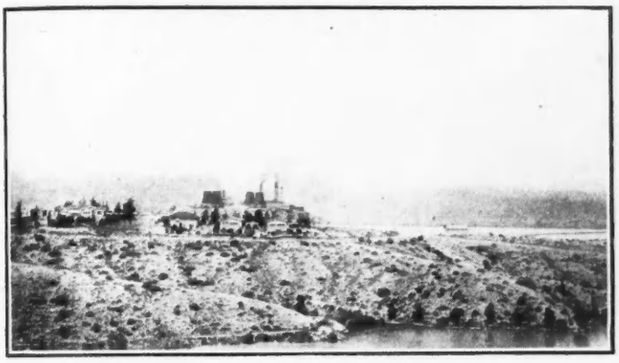
The company has just completed six dwellings for the convenience of its employees having families and is building a moving picture theater to afford amusement and instruction.

Rich Ore in Geraldine Mine

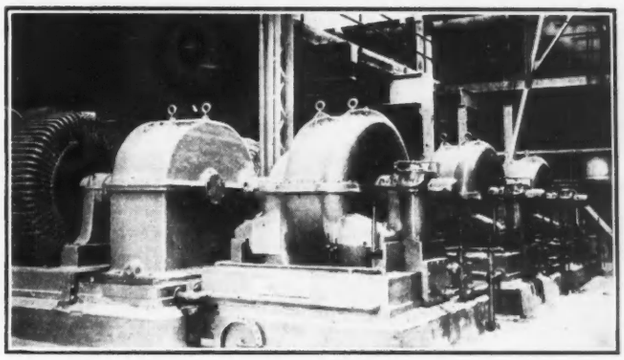
A rich grade of ore is being maintained with continued development at the Geraldine mine of the reorganized Silver King Mining Co. at Confidence, Tuolumne County, Calif., where from 2 to 3 ft. of high-grade gold ore was recently opened on the 75-ft. level from the incline shaft. This drift is now out more than 60 ft.

The shaft is nearing the 125-ft. point, from which drifts will be run both ways on the vein for further development. Sinking will be continued to 300 ft. It is planned to erect a 150-ton mill when a large tonnage of ore has been blocked out.

A substantial working fund is being provided by the syndicate that recently took over control of the Silver King Mining Co. Many mining men are visiting the Silver King property to inspect the Geraldine strike.



International Smelter, Miami, Ariz.



Blowers at Miami Copper Co.'s mill

Development Work Near Shasta, Calif.

Development work is under way on the properties of the Shasta View Gold Mining Co., one and a half miles from Shasta on the Weaverville highway. This property has several well-defined veins, which range in width from 2 to 14 ft. There is a small stamp mill on the property, but the company plans to install a cyanide plant. At the Ganim mine, two miles from the Shasta View, the crosscut tunnel has been driven 172 ft. in pay ore.

Proposed Drainage Tunnel at Blind Spring Hill

Preliminary to the immediate driving of a 7,500-ft. haulage and drainage crosscut tunnel and as a site for its proposed milling plant, the Comanche Mining & Reduction Co., of Los Angeles, Calif., has purchased the Keller 160-acre ranch at the eastern base of Blind Spring Hill, thirty miles north of Bishop and adjoining on the east the mineral holdings of that corporation. The management has decided that the physical condition of the various mines comprising the company's property justifies the extension of an adit that, according to surveys recently made, will in the length contemplated intersect no less than sixteen veins. The maximum depth the bore will attain in passing through the hill will be 1,600 ft. The tunnel will be sufficiently large to permit of the operation of electric storage battery locomotives.

Large Reserves Added to Hecla Mine

The recent strike in the Hecla mine at Burke, Idaho, has added much to the ore reserves and many years to the productive life of the mine. The formation and vein structure are identical with those above, and all conditions indicate that this great ore shoot extends unimpared for another 1,000 ft. or more. Assuming that exploration of the vein on the new or 2,800 level will prove that it maintains its usual dimensions, this strike means the addition of a block of ore 1,600 ft. long, 800 ft. deep and having an average thickness of 20 ft. The discovery of this ore means that Hecla will extend the main shaft 800 ft. deeper. The Hecla company will also install a new hoist by the time the shaft is deepened, as the present hoist is now operating at about its capacity.

Options on 20,000 Acres St. Francois Co., Mo.

Joplin and New York parties have secured options on about 20,000 acres of land that is on or beyond the fringe of the present developments in St. Francois County, Missouri. Most of the lead is in the neighborhood of Farmington, French Village, or Avon and is regarded as "very wild" by the old-timers. One diamond drill has started prospecting and more are to be added, but it will take several years with a fleet of 100 drills to prospect this huge area properly. Formerly one drill hole on 40 acres was supposed to give ample evidence of the lead value of the tract, but now it is known that several drill holes are often required on a single acre before its value can be safely determined.

St. Louis interests recently bought several tracts in fee near the eastern edge of the Flat River district at $100 to $250 an acre without drilling. Drilling the tracts is likely to be deferred for some time.

The National Lead Co. has optioned considerable land near Hazel Run, in St. Francois County, Missouri, where old shallow lead diggings occur, that are now being prospected with a drill and where disseminated lead may be expected at 500 to 1,000 ft.

The shallow diggings on the old Palmer property, in Washington County, are being re-opened by local interests. These "gopher workings" have produced more than $2,000,000 in the past and some disseminated lead was found at 900 ft. in two holes drilled several years ago.

The Annapolis lead mine remains shut down since it went into the hands of a receiver after the severe damage to the surface plant by the cyclone last spring.

St. Joe Lead Co. Reopens Mine la Motte

The St. Joe Lead Co. has started sinking a shaft on the old Mine la Motte property, which it has had under option for several years. The shaft is located on the southeastern part of the old grant, in territory that has not been worked during the 200 years of activity. Excellent drill cuttings are said to have been found near a fault at about 500 ft. in depth, whereas the old shafts are only 100 to 200 ft. deep. The orebody is said to extend over the line into neighboring farm lands, which are also under option.

Zinc Ore Discovered Near Ash Grove, Mo.

Excellent zinc deposits are said to have been discovered recently on the property of the Sac River Lead & Zinc Co., eight miles northwest of Ash Grove, Mo. At a depth of 35 ft. company engineers discovered a 7½-ft. face of 20 per cent zinc ore. Two additional test holes have been drilled, one to a depth of 205 ft. and the other to 188 ft. Zinc ore was found in both. The Sac River company has under lease or option approximately 2,800 acres of ground in that vicinity.

Mining Corporation Produced 400,000 Oz. During Second Quarter

AN INTERIM REPORT on the Mining Corporation properties in Cobalt and South Lorrain has been issued, which covers a period from April to June, and shows a production for the quarter amounting to 400,000 oz., the average grade of the ore sent to the mill being 19 oz. to the ton. At Cobalt, work was largely confined to the Cobalt Lake property, where considerable new ore has been developed. At South Lorrain, on the 150-ft. level of the Watson vein, a shoot of high-grade ore has been opened up for 50 ft. Production from the Lorrain-Trout Lake property, which is operated by the Mining Corporation, was 170,000 oz. for the quarter. Development work has been limited on account of the capacity of the incline shaft, and the total footage advance for the period was 546 ft. Sinking of the new shaft on the south claim is now well under way, and the workings in this shaft will eventually be connected with the present shaft. The Keeley mine has declared the regular half-yearly dividend of 8 per cent, together with an extra bonus of 4 per cent, being at the rate of 24 per cent a year.

Copper Ore in Rouyn Gold District, Quebec

An important find has been made on the J. H. C. Waite property in Duprat Township in the Rouyn gold area of Quebec, which, judging from surface showings, compares favorably with the Noranda. Work has exposed an orebody 175x85 ft., the trenching at last accounts being still in ore. The ore shows a high grade of copper content. The Waite property is situated about four and one-half miles northwest of the Horne and adjoins the Amulet to the north.

Development at Penn-Canadian Mines Is Slow

It is understood that operations at the Penn-Canadian property, which is controlled by the Doherty-Easson syndicate, are not up to expectations. Diamond drilling in the east part of the property has shown that the conglomerate underlying the diabase is very much thinner than expected and consequently is of little importance. It has also been found that the broken ore in the mine was of lower grade than expected, and unless something new and of better grade is found, it is thought that operations will be stopped as soon as the known ore is cleaned up.

In July the Menago Co. of Cobalt sent 1,500 tons of ore to the Mining Corporation mill, and it is understood that the grade is approximately 30 oz. per ton.

New Mining Association Is Formed in Idaho

By Ernest Flagg Ayres

Articles of incorporation for the Southern Idaho Mining Bureau were filed with the Secretary of State on Aug. 3, and a membership campaign has been begun. No active work is contemplated until at least 400 members have been obtained. J. H. Hawley, formerly Governor of Idaho, is president of the bureau; E. B. Sherman, ex-Mayor of Boise, is secretary; and Gordon C. Smith, mining engineer, is treasurer. Other members of the board of directors are S. K. Atkinson, Fremont Wood, Stanley Smith, Ern G. Eagleson, R. K. Davis, and Robert N. Bell, all of Boise.

The objects of the bureau, as set forth in the articles of incorporation, are: To advertise the mineral resources of southern and central Idaho, and to stimulate and build up the mining industry and the establishment of enterprises and payrolls; to furnish to members such advice and assistance as may be necessary to place properties in condition to merit publicity, and in general to assist members in every proper way that the financial strength of the bureau may justify; to establish and maintain an information bureau for the benefit of the public and of the members, furnishing such information directly, or referring the inquirer to the exact source where such information is available; to co-operate with the state mining officials, the state Bureau of Mines, and the state mining association.

The bureau does not expect to employ any corps of experts on whom it will depend for reports, nor will it guarantee any prospect or mining property. Information will be secured from mining engineers already in the field, and passed on to inquirers with an explanation of the exact status of the report. Neither the association nor its officers will maintain a brokerage business, and no discrimination will be shown in favor of any individuals or districts.

Porcupine Goldfields Development & Finance Co. Reorganized

A recent meeting of the Porcupine Goldfields Development & Finance Co. indicates an amicable settlement of the differences that existed among some of the directors. The capital reduction scheme was approved and the company is now in a position to proceed with the more extensive development of its properties. The most important of these at the present time is the Ankerite mine in Porcupine, where the manager has recommended the sinking of a new central shaft and the installation of a mining plant, to be followed by the erection of a mill as soon as the size of the orebody in the No. 5 vein has been ascertained. The No. 5 vein is a comparatively recent discovery and diamond drilling indicated greater widths and better values than in the other part of the property. The company also has under option the Young-Davidson property in Matachewan, but developments to date, while encouraging, are by no means conclusive.

News From Washington

By PAUL WOOTON
Special Correspondent

Subsidy Granted Coal Operators in England

Strike Averted, but Troubles Not Settled—Rehabilitation of Business Will Require Long Period

GRANTING of a government subsidy to the business on which the entire British industrial structure rests is regarded in Washington as a makeshift intended only to postpone a general strike until the country is in a better position to withstand such a shock. If the coal industry in Great Britain cannot stand alone, what must be the state of many other activities in that country, it is asked.

The British coal industry is in a position where it cannot pay profits to owners and wages at the present rate to the men. Someone has to get along with less. The government has not been strong enough to require either the miners or the operators to get along with less. It also has been unable to influence the low-cost producers to agree to contribute their surplus profits to a wages pool.

It is recognized that the conservative leaders in Great Britain know just how unsound is the settlement they have effected. That they were forced to such an expedient to postpone the crisis is taken as evidence that British business is in worse straits than had been realized here. In this we have much concern. Our own prosperity is dependent to an extent on the prosperity of our best customer. There are in addition reasons of state and of sentiment why the people of this country want to see the British overcome their difficulties promptly.

The chances, however, seem to be very much against a sufficient recovery of business to pull Great Britain out of its depression. The more general prediction is that there must be a general readjustment of British trade with much less reliance placed on coal. This change, however, must be spread over a long period. It involves the mechanicalization of the mines and the development of a superpower system. Most important of all is the working out of some plan that will induce the mine worker to do his best.

The British coal industry is in no position now to await gradual improvement. Something has to be done promptly to reduce costs. As labor represents three-fourths of all costs, a reduced wage offers the more immediate way of meeting the situation. The expectation here is that it will have to be resorted to sooner or later. This doubtless will mean a general strike and a finish fight with organized labor. British labor in all lines has adopted a policy of discouraging productivity on the part of the individual worker.

Under the readjustment that is expected Great Britain will withdraw to a certain extent from the world coal trade and try to use large quantities at home. No country has a better opportunity to utilize superpower to advantage. Electric power could be made available throughout the country at a cost that would give British manufacturers some advantage. If the buying power of the tropics, of Germany, and of Russia, should increase in marked fashion there is a chance for some settlement of the coal controversy.

Physical Properties of Feldspar Studied by Bureau of Standards

The Bureau of Standards has undertaken an extensive investigation including a detailed study of the physical and chemical properties of all the raw materials used in the manufacture of chinaware, sanitary ware and similar products, and the effects of these qualities on the properties of the finished product. The bureau is now studying the properties of feldspar, and the data so far obtained, though only of a preliminary nature, show that a great difference exists in the various commercial feldspars as regards content of potash feldspar, soda feldspar and quartz. The refractoriness increases roughly with the increase in potash feldspar. The investigation has not progressed sufficiently to warrant any conclusions as to the effects of the variations in the composition of commercial feldspar on the qualities of the chinaware and other products in which it is used.

Research Work by Government Bureaus

Since the Bureau of Mines advisory committee is expected to consider the character of research that a government bureau is justified in undertaking with public funds, the following excerpts from a recent paper by F. W. Sperr, director of research for the Koppers Co., has been called to the attention of that committee:

"We are accustomed to classify research broadly in two great divisions—research for advancement of pure knowledge, and research for industrial improvement.

"As a matter of fact, there is no research for advancement of pure knowledge that may not contribute directly or indirectly to industrial improvement, but for practical purposes a real division exists. Pure research is exploration. Industrial research is exploitation. The scientist engaged in pure research is the explorer who discovers and maps a new island. The one engaged in industrial research is the prospector who goes to develop its resources. The first man, theoretically at least, has no thought of the monetary value of his work; the second is actuated by practical considerations.

"There is, however, a third great division of research, somewhat intangible in its outlines and difficult to name in an understandable way. It covers such subjects as public health and hygiene and the public relations of industry as exemplified by research in the standardization of weights and measures, research in the prevention of waste of our natural resources, research in the control and abatement of industrial nuisances, research for national defense, and any sort of research in the problems of public welfare. We may, in fact, designate this division as research in public welfare.

"One can readily see that those interested in the foundation of the great research agencies of the United States Government had this division of research clearly in mind. Research in public welfare is the primary function of such agencies. No such research is of great importance and could not be fully covered even with many more men and much larger appropriations.

"The excellent work of the United States Bureau of Standards on the properties of refractory materials, the development of the Edwards specific gravity apparatus, the standardization of thermometers, gas meters, calorimeters, and other appliances, and the study of methods of testing are all examples of research that comes within the legitimate field of the bureau and that is of great value both to the industry and the public. The investigations of the Bureau of Mines into the fundamental composition and properties of coal, its research in heat transmission and the use of coke in domestic furnaces, its study of carbon monoxide poisoning, its development of first aid training, its work in the promotion of safety and health in industry, are examples of legitimate activities that are of conspicuous value to the industry and to the public.

"We should strive to create a greater popular appreciation of the fundamental and public welfare research of the government bureaus and should urge upon our Congressmen the necessity of adequate support for such research.

"What seems to be the principal difficulty in the ideal separation of public welfare research and fundamental research from commercial research is that the former are difficult to measure in dollars and cents, while the results of industrial research are easier to evaluate and consequently seem more attractive."

First Meeting of Bureau of Mines Advisory Committee

Initial sessions of Secretary Hoover's advisory committee on the activities of the Commerce Department that affect the mining industry were devoted entirely to the presentation of organization questions raised by the transfer of the Bureau of Mines. The committee held its first meeting Aug. 6 and 7. Most of the time was devoted to hearing the views of the directors of the Bureau of Standards, of the Bureau of Mines and of their division chiefs. The Bureau of Foreign and Domestic Commerce submitted a written statement.

The committee acted formally in electing as its president J. V. W. Reynders, who is president of the American Institute of Mining and Metallurgical Engineers; and as its secretary, C. P. White, who is chief of the coal division.

Secretary Hoover explained at the opening meeting that he is anxious to know what value the mining industry attaches to the work the Bureau of Mines has done and what suggestions it has for the future conduct of the bureau, now that it is associated more closely with the agencies in the Department of Commerce that have been serving the mining industry.

The committee learned that fundamental issues are involved. Apparently the form of organization of the Bureau of Mines will be analyzed and other forms of organization will be considered. The committee seems disposed to disregard the personal fortune of any bureau official as well as the ambitions of any particular bureau. The controlling motive is so to correlate the activities of the Department of Commerce as to be of most benefit to the mining industry.

The committee will hold its next meeting in September in Salt Lake City, where contact will be established with numerous representatives of the industry.

L. S. Cates, president of the American Mining Congress, was unable to attend the meeting in Washington. He was represented, however, by James F. Callbreath, the secretary of the Mining Congress. Philip Murray, of the United Mine Workers, also was prevented from coming, and sent F. P. Hanaway, his assistant, to represent him. D. M. Folsom, the representative of the American Petroleum Institute, could not attend, but the other members of the committee—Chairman Reynders, Secretary White, J. G. Bradley, of the National Coal Association, and H. Foster Bain, former director of the Bureau of Mines—were in attendance.

One of the important points for consideration is the correlation of the work of the division of mineral technology and the division of mineral resources, in the Bureau of Mines, and the relation of that work to the Bureau of Foreign and Domestic Commerce.

Godiva Mine Acquired by J. W. McChrystal

Control of the Godiva mine, at Eureka, Utah, has been acquired by Jackson W. McChrystal from Edward W. Packard. Plans of Mr. McChrystal are to increase the scale of operations. One of the first things to be done will be to retimber the shaft from the 900 to the 1,200 level. It is possible that some work may be undertaken from the 1,800 level of the May Day mine, which has a level reaching almost to the Godiva line.

Operations at the Godiva have been largely on the leasing basis. On the 750-ft. level, high-grade ore is being mined in an area below one of the stopes that produced the largest tonnage in the mine. On the 900 level a winze is being sunk on a showing of high-grade silver-lead ore.

Mine and mill, Keystone Mining Co., Park City, Utah

Keystone Mining Co. Declares First Dividend

The Keystone Mining Co., Park City, Utah, will pay its first dividend on Aug. 26. This disbursement of 7½c. a share will amount to $65,000. It is the intention of directors to pay 15c. per share a year. The production of the company is about 500 tons of concentrate monthly and 400 tons of first-class ore. The concentrate contains about 40 per cent lead and 16 oz. of silver per ton; first-class ore, 12 to 15 oz. of silver to the ton and 25 to 30 per cent lead. Exposure, on the 500 level, of the bedded ore deposits productive on the upper levels has greatly improved the property. The deposit on this level is from 20 to 25 ft. thick, more than 150 ft. long, and 50 or 60 ft. wide. As all of the ore produced from the Keystone up to date has come from the formations overlying the Park City formation, it is believed that the company has large reserves on the deeper levels.

A Possible Market for Limestone and Gypsum

A wide extension of coal-mine dusting demands a tremendous tonnage of dusting material. The location of a source of supply is one of the first problems that confronts the coal-mine operator. For better observation of the accumulating coal dust, and for effect of illumination, the dust should be light in color. To safeguard the miner's health the dust must be low in silica. The price must be very moderate or the cost of dusting will be prohibitive.

Limestone, gypsum, and anhydrite are materials that admirably fulfill the necessary conditions imposed, and limestone in particular is widely distributed in most of the coal-mining regions. In order to assist coal-mine operators in obtaining the necessary rock dust, the Bureau of Mines has prepared a report (Bulletin 247) with a series of fifteen maps indicating the location of limestone quarries and gypsum mines that may supply the desired materials. The maps cover the chief soft coal-mining regions of the country. There is indicated on each map the active coal-mining regions and also the limestone quarries and gypsum mines that have been developed in these regions.

Gleaner Mine Is Being Developed by Deep Tunnels

Henry H. Armstead, of Kaslo, has just returned to Vancouver from a trip to the Atlin district, B. C. He visited the Gleaner mine, which adjoins the Engineer property on Taku Arm, and states that the Engineer mine is being developed along broad lines, using modern methods and efficient management. The geological structure of the Gleaner mine is identical with that of the Engineer mine. During his visit to the Gleaner Mr. Armstead devised plans to develop the property with a deep tunnel.

Process Discovered for Tempering Lead

Announcement has been made by the Hawthorne plant of the Western Electric Co. that R. S. Dean and W. E. Hudson, metallurgical engineers, have discovered a process for hardening lead.

The new tempered lead, which is made with the use of a small percentage of alloy and the treatment of the metal by a special heating process, makes a metal three times as hard as ordinary hard lead.

Iron and Steel Plant Proposed for Fernie, B. C.

W. R. Wilson, president and managing director of the Crow's Nest Pass Coal Co., has interested British capitalists in a project to establish a small iron and steel plant at Fernie, B. C., using coal from Crow's Nest and hematite from Iron Mountain, which is ten miles east of Creston, on the Canadian Pacific Railway. As a preliminary toward this project, the group of claims owned by C. P. Hill and associates will be thoroughly explored by diamond drilling. What promise to be extensive deposits of high-grade hematite, low in phosphorus, have been uncovered at several points.

Begin Ore Shipments to Smelter at Trail, B. C.

The Allenby Copper Corporation is expected to commence shipping concentrate to the Trail smelter early in August; 200 men now are employed at mine and smelter and more will be employed as soon as the branch line repairs have been completed.

Since the reopening of the C.P.R. branch from Kaslo to Nakusp, the Lucky Jim Lead & Zinc Co. has shipped 800 tons of concentrates to Trail, and now is taking its place among the largest independent shippers of concentrates.

The Consolidated M. & S. Co. has started the first unit of its new zinc plant and the final unit of its lead refinery, thus adding 20 tons of bar zinc and 50 tons of refined lead to its daily output. The company now is operating a custom concentrator at Trail.

Mill Tailings Used for Road Building

Several of the Michigan copper mines, including Ahmeek and Isle Royale, are disposing of considerable quantities of tailings or stamp sand for road-building purposes. The material is being shipped outside of the district. Vein rock ground into minute particles is well adapted to road construction and through its use in the lake region the highways rank with the best in the Middle West. There are millions of tons of the sand in the Keweenaw waterways, and if a market can be found for large tonnages, it should prove a new source of revenue for the mines.

Stripping at Scranton Mine Completed

The Winston Dear Co. is removing trackage, dismantling a 300-ton steam shovel, and withdrawing its machinery from the Scranton mine at Hibbing, Minn., after a three-year stripping operation in which it removed approximately 5,000,000 yd. While this work was in progress, the mine erected a screening plant and prepared to load the ore from the pit. Much trouble was experienced in this stripping program due to quicksand. At one time a 300-ton shovel was submerged, and a second 300-ton shovel had to be put in to dig out the first one.

Underground Ore-Dressing Plant

A COMPLETE ore-dressing plant to be erected underground is the unique experiment that the Treadwell Yukon Co. proposes to try at its mine at Keno Hill in order to circumvent the difficulties arising from the intense cold of the Yukon winters. It was feared that the water used in the ore dressing would freeze in winter in a surface plant. In any case, the cost of keeping the buildings warm would be excessive. Tests are now being made to determine the type of mill required.

Blue Bird Mine, Butte, Mont.

Engineers in touch with mining activities in the western portion of the Butte district report that during the past few months engineers representing an Eastern automobile manufacturer and a large Eastern zinc-producing corporation have been making examinations of the Blue Bird group.

The Blue Bird group comprises twenty-five patented lode claims (250 acres) two miles west of the center of the city of Butte. It was operated from 1885 to 1892, being at that time the largest silver mine in Butte. The mill contained ninety stamps.

The property was worked and stoped to the fifth level (vertical depth 360 ft.) and was shut down on account of apex litigation between the Blue Bird and the Little Darling claims. The group comprises the claims that were in litigation. E. H. Wilson and John Gillie, consulting engineer for the Anaconda Copper Mining Co., had a lease on the Little Darling claim in 1892 and opened large bodies of zinc-silver ore at comparatively shallow depth, but were obliged to stop shipments on account of the heavy smelter penalty on the zinc contents of the ore.

Eureka Smelting Co. to Build Smelter

John E. Sexton, vice-president of the Eureka Smelting Co., recently announced that his company would shortly build a lead-silver smelter at Eureka, Nev. A survey of the proposed site, the Eureka-Nevada Railroad, and various mines owned by the company was recently made by John H. Sherburne, general manager, and plans were submitted for approval to President Pelham, Boston capitalist. The smelter product will be shipped to Eastern refineries via the Panama Canal.

Shipments from the Eureka Holly mine are going to Utah smelters at the rate of 25 tons weekly, with the mill turning out thirty to thirty-five cars of silver-lead concentrates per week.

Final Payment on Rochester Mine

The final payment of $55,000 due on the Rochester property in Porcupine has been made by the Canadian Gold Mines Corporation. This property has been operated by a subsidiary company called the Canadel Gold, Ltd.

Railway Planned for Rouyn Mines, Quebec

Plans for the Rouyn Mines Railway, an extension of the Canadian National Railways to the gold fields of northwestern Quebec, have been submitted to Premier Taschereau, who stated that he was satisfied with the route selected, which runs from O'Brien to Rouyn Township. As the greater part of the route passes through crown lands, little expropriation will be necessary. The project will be aided to the extent of $250,000 by the Quebec Government, and it is understood that the Dominion Government will also assist financially.

De Beers Diamond Control to Pass

Control of the world output of diamonds, long held under an agreement of the principal producers by the De Beers syndicate of South Africa, will pass to a new combination in 1926.

Completion of negotiations looking to the new organization has been announced by Lee Reichman, head of Reichman Bros., the leading American diamond importers. He said the new control would include the Barnato fields of Cape Colony, the Dunkelsbuhler interests of Germany, and the Morgan interests in New York. The new syndicate, according to Mr. Reichman, will take over control Dec. 31, 1925, when the De Beers agreement expires.

Iron Ore Exports From Sweden Increase

Iron ore exports have improved considerably and announcement has been made that with the turn of the year operations in the Lapland mines will be resumed on a full-week basis. Operations since 1921 have been on a four- to five-day week basis.

Tungsten Deposits Reported at Iron Mountain, Mo.

George F. O'Brien, mining engineer, Cedar Rapids, Ia., has obtained a lease on five acres of the W. H. Light farm near Ironton, Mo., upon which a deposit of tungsten is said to have been discovered about two weeks ago. Mr. O'Brien is also interested in tungsten mining operations in the vicinity of Fredericktown, Mo. Work on the new discovery near Ironton will begin soon.

Inventory of Water Resources of the United States

A bill providing for "an inventory of the water resources of the United States" will be introduced at the forthcoming session of Congress. The proposed legislation authorizes the director of the U. S. Geological Survey to make this inventory for use in setting up a comprehensive plan "for developing both surface and ground waters for domestic and industrial supplies, irrigation, navigation, power, and other uses, and for the conservation and control of flood water." An appropriation of $400,000 is sought for the first year's work and $500,000 for each year for nineteen years thereafter.

London Letter

By W. A. Doman
Special Correspondent

Placer Gold in Siberia

Rhodesian Copper Companies Making Slow Progress—Bisichi Tin Co. Installs Mechanical Equipment

London, July 28—According to news received from Riga, there is considerable activity in prospecting for gold in Siberia. In the district of Aldan a large alluvial goldfield is said to exist, and 400 tons of gold is officially said to be proved. How this estimate was arrived at is not stated, but operations have been in progress for something like twelve months, and communication with Yakutsk is maintained by airplane. The Soviet authorities keep as strict a surveillance as possible, but owing to the great distances and the scarcity of provisions much difficulty is experienced. There seems to be little doubt of the existence of gold, and Chinese and Japanese are reported to be flocking to the district, which covers an area of 6,000 square miles. I have had a conversation with an English mining engineer who was recently in Siberia on a mission from capitalists in London. He tells me he could make his fortune by getting his principals to take up concessions, of which he could obtain many, but he does not consider the conditions satisfactory. The Soviet authorities from Moscow are not always to be trusted, though the local officials are more enlightened and are ready to give assistance. One trouble is the lack of labor. Even Chinese cannot be employed unless they are paid the same high rates of wages demanded for the Russians. Men would have to be obtained from great distances; houses would have to be erected for them, and they would have to be provisioned, and none of these problems is capable of solution at present. My informant was by no means hopeful of what could be accomplished in the near future.

W. E. Thorne, an alluvial mining authority, has returned from northern Rhodesia. He went out, I understand, on a mission for the Minerals Separation and Rhodesia Congo Border group to report on alluvial gold discoveries.

I understand that the Consolidated Gold Fields is buying shares in the Mexican Corporation, which has ore reserves developed of 6,500,000 tons, or nearly five years' supply of ore.

The dredge of the Dome Mining (Spain) has now officially started on the Orbigo River, some of the directors, together with the consulting engineer, being present at the ceremony.

Possibly on account of distances, Rhodesian copper companies are not making the rapid progress that shareholders had expected of them, and for some companies further capital requirements are talked of. The Rhodesia Broken Hill Development proposes to double its capital of £1,000,000 to provide money for the erection of a zinc plant to produce 40 tons of zinc per day and for the extension of the Mulungushi hydraulic plant to supply an additional 10,000 hp. The shares have a nominal value of 5s. and for 1,500,000 placed, the somewhat stiff commission of 1s. per share is paid.

The Bisichi Tin Co. (Nigeria) was one of the first to win tin by means of mechanical equipment. Last year the amount so recovered was 267 tons, against 225 tons, and it is expected that in subsequent years the recovery by hydraulicking and mechanical plant will be much greater. The suction cutter dredge, capable of dealing with 60,000 cu.yd. per month, is now on the property and will shortly be put into commission.

Gold Standard Criticized in Great Britain

The second month of the gold standard in Great Britain shows much unevenness in efforts of trade and industry to make adjustments to the new basis, principally in short uneven price reductions and wage adjustments, says cable advices to the Department of Commerce from London. Opponents to the gold standard adoption in June now urge the return to inflation by the export of gold and by further issue of Treasury bills. There is some sentiment for reduction of bank rate, but the prevailing conservative opinion favors waiting until the middle of autumn to see if the expected trade revival comes. The policy of temporarily prohibiting the fluctuation of foreign loans in London is frequently attacked on the ground that it is driving borrowers into new fields and keeping considerable money out of this market.

Mineral Production of Broken Hill

In the last two years at Broken Hill, New South Wales, Australia, there has been a steadily increasing output of silver, lead, and zinc. Including the companies engaged in the treatment of zinkiferous tailings, the total value of the production last year was £5,043,139, while that for 1923 was £4,672,331. In 1924, shareholders received £1,076,331 in dividends, compared with a distribution of £813,650 in 1923.

Financial Conditions of German Steel Works Still Difficult

The financial situation of the large works of the German steel industry continue to be very difficult, Consul A. W. Kliefoth, Berlin, advices the Department of Commerce. Money comes in very slowly, while charges for works remain unlimited. The industry reports that the high railway freights are a great obstacle for the favorable development of economic conditions.

On account of the fact that German exporters are greatly hampered by too high cost of production, an agreement has been reached between the Raw Steel Association and the Iron and Steel Goods Association on the one side and the Association of German Machine Building Enterprises on the other hand, according to which raw materials will be delivered to exporting firms at world market prices provided that it can be proved that these raw materials are needed for export purposes.

Development of Iron Ore Deposits at Durango

It is reported by Pioquinto Moreno of Durango, Mexico, that a group of Americans are interested in plans for the development on an extensive scale of a part of the famous Cerro de Mercado, or Iron Mountain, as it is called by Americans, situated in the outskirts of the city. Moreno recently obtained title to fifty claims, covering a part of this vast deposit of iron ore. For several years the Monterey Iron & Steel Co. has obtained its supply of iron ore for its great iron and steel plant at Monterey from Iron Mountain. The mine was owned at one time by the late Collis P. Huntington, and while he was head of the Southern Pacific he constructed the Mexican International Railroad, now a part of the National Railways of Mexico, from Eagle Pass, Tex., to Durango to give a transportation outlet for the ore. The property passed out of his hands and the ore has been mined in a desultory sort of way for many years.

For many years the iron ore was conveyed from this deposit by ox cart, with its cumbersome wooden wheels, or in panniers on the backs of animals, seven miles to the Piedra Azul Iron Works, on the Tunal River, and there smelted with charcoal into pig iron, which was subsequently puddled with pine wood and rolled into merchantable shapes. At that time Durango was 600 miles from any railroad. Under such circumstances all products of iron or steel commanded exorbitant prices in Durango, although this mountain of iron ore, containing millions of tons, was just outside the city limits.

Santo Domingo Mining Co., Chihuahua

The Santo Domingo Mining Co. is planning to equip its Namiquipa mine in Chihuahua with modern reduction works and power plant. These mines have been worked in a small way for more than twenty years, but due to long distance haul to railroad only high-grade ores have been shipped from the camp. There are several smaller companies and leasers working in the camp. The largest and most extensive claims are held by the Santo Domingo. It has about 3,500 tons of ore on the dump ready for the mill, with a fair-sized tonnage blocked out underground. According to records kept, the dump ores will average about $25 in silver and about 1 per cent lead.

S. K. Dahl, milling and mechanical engineer of Los Angeles, recently made an inspection trip to the mine and is now testing the ores. Plans are being prepared for a steam electric power plant, a countercurrent continuous decantation cyanide plant, and dust precipitators.

Talc and Soapstone in Canada, 1924

Talc and soapstone production in Canada during 1924 amounted to 11,332 tons, valued at $154,480, as against 10,366 tons, valued at $150,507, in the previous year, according to figures issued by the Bureau of Statistics.

Societies, Addresses, and Reports

Argue for Gold Bonus in Western Australia

Statistics, Rather Than Generalities, Feature the Evidence of the Chamber of Mines

THE gold-mining industry of Australia, in common with that of other countries producing gold, is seriously handicapped as a consequence of the increased cost of labor and supplies, contrasted with fixed selling price for the product of their mines. As long as the so-called "premium" existed on gold, because of the depreciation in the pound sterling in terms of dollars, the situation was not so acute. Now the industry is threatened with early extinction. The argument of the Chamber of Mines of Western Australia in favor of a government bonus on gold deserves particular attention because of the great importance of the gold industry compared with other industries in Western Australia. The following statement was made to the Royal Commission at Kalgoorlie on April 15:

Numerous other witnesses have given the commission much evidence to show the disabilities under which the State of Western Australia suffers. The chamber restricts itself to placing before the commission evidence of disability under which the gold-mining industry in this state suffers, considering that the evidence given of other disabilities is good and sufficient.

The commission, we believe, would prefer, rather than generalities, to have the evidence submitted to it supported by figures showing the relative importance of the industry, the benefit it is to the commonwealth and this state, and the cause of its depression. We have, therefore, taken the commonwealth and state year books as the authority on which to base our figures, and to these the chamber adds its views on what it considers to be the best means of assisting the gold-mining industry.

Causes Recited

The causes of the present depression in the industry are set out in the address, which we submit herewith, delivered by the president at the last annual general meeting of the chamber. Briefly, the alarming and continuous decline of mining is attributable mainly to the great increase in working costs since 1914, which precludes the treatment of any but fairly high-grade ore. Of this increase the two principal causes are the war, with its general enhancement of prices, and the high federal tariff. The tariff acts in three ways:

(1) The customs duty raises the cost of mining machinery and requisites, a handicap on mines not yet equipped; (2) it increases the cost of living, and so necessitates the payment of higher wages, both to those employed on the mines and to those employed in subsidiary industries; and (3) it thus adds considerably to the price of materials required in mining work. As the price of gold is fixed, the mining industry cannot do like others and pass on to the purchaser of gold any increase in the cost production of gold.

In showing the importance of the industry to the commonwealth and the state we have based our figures on the year 1923, as that is the latest year in which the statistics for both have been completed. The difference between that year and last year will not be much, but, if the figures for 1924 were available, we feel sure that they would strengthen our argument.

Relative Importance of the Industry

In 1923 the total population of the commonwealth was 5,749,807; the total commonwealth taxes per head of population were £8.6; the total production per head of population was £67.8; and total exports per head were £19.9. The population of Western Australia was 353,815; the total state taxes per head were £2.7; the total production per head was £70.1, and the value of exports of primary products per head was £27.3.

In this state the gold production amounted to £2,105,483, from 781,769 tons of ore treated; and the number of men employed in producing it was 5,347. The goldfields towns of this state are practically isolated, and it is, therefore, easy to learn what is the proportion of people who live in the neighborhood of the mines and depend for their livelihood upon the mines, as compared with the number of men actually working on the mines. We find that the proportion is at least six to one. If we multiply 5,347 by 6 the result is 32,082. The value of the state's gold production, divided by this figure, shows a production of £65.6 per head for the year.

The price of wheat in 1923 was about equal to the average price during the previous fifteen years; but the price of wool in 1923 was about 16 per cent higher than the average of the four previous years. The generally increased price of everything produced in Australia has inflated the value of the production per head of population in both the commonwealth and the state; and yet the value of the production per head of the people on the goldfields, with gold at its standard price of £4 5s. per ounce, was £65.6; a figure that compares well with the production per head of the state of £70.1, or of the commonwealth of £67.8—which would have been £65 had wool been at a normal price in 1923.

To serve the goldfields of this state, 1,160 miles of railways have been built, 2,000 miles of roads made, 350 miles of piping to deliver 5 million gallons of water per day laid down, innumerable reservoirs for water constructed, 1,700 miles of telegraph and 3,000 miles of telephone lines erected. Many towns have been built; but, taking the towns of Kalgoorlie and Boulder only, these on municipal value based on five years' purchase represent more than £1,000,000. To these may be added the value of the mine plants as shown in the Western Australian Mines Department annual report for the year 1923, £1,950,000. It is an easy matter to prove that these items added together have a total value of over £8,000,000.

Our desire in making the above enumeration is to show the magnitude of the commonwealth, state and private interests that are at stake as being bound up with and almost wholly dependent on the prosperity of the mining industry. Seeing the production per head of population in 1923 was, in the commonwealth, £67.8, and in the state £70.1, and that the gold production per head £65.6, we submit that the commission should most carefully consider the great harm that will be done to the State of Western Australia and, therefore, in a lesser degree to the commonwealth if the gold-mining industry is allowed to die. We think the figures given show that it is well worth preserving.

In 1923 the commonwealth received in taxation £8.6 per head of population. The 32,082 goldfields people, therefore, contributed the sum of £275,905 in all. If now the commonwealth assists the industry by granting a bonus of 20s. per ounce on all gold produced, the total sum—based on the 1923 figures, 781,769 tons treated for a value of 495,672 oz.—would be £495,672. Deduct from this the sum of £275,905 paid in taxation by the people of the goldfields; and the difference of £219,767 represents the net payment by the commonwealth on account of the gold bonus that is for the assistance of the industry.

Permit Mining Low-Grade Ore

The average value of the ore mined and treated in 1923 on the Western Australian goldfields was over 12 dwt. per ton. A bonus of 20s. per oz., or 1/— per dwt., would be equivalent to 12s. per ton. This would enable the mines to treat a very much larger percentage of low-grade ore than now, which would greatly prolong the life of the present producing mines. It would enable mines having 6 to 8 dwt. ore to work at a profit, and would greatly stimulate the search for new mines. With the increase in the tonnage treated, it is safe to predict that the population of the goldfields of this state would be increased 50 per cent in a comparatively short space of time. If 50 per cent more ore were treated, the average grade would drop to 10 dwt.

A 50 per cent increase in the tonnage treated—by adding one ton of 6 dwt. ore to the two tons of 12 dwt.—would mean a total of 1,172,653 tons at an average of 10 dwt. per ton. That would produce 586,326 oz. of gold, which would mean a bonus of £586,326. The consequent 50 per cent increase of goldfields population would bring the total up to 48,123. This population would pay to the commonwealth in

taxes at £8.6 per head, £413,857, leaving a reduced difference of £172,469 to represent the net assistance given by the commonwealth to the industry.

Again, if the tonnage treated were doubled, as it very probably would be, by adding one ton of 6 dwt. ore to one ton of the present 12 dwt. ore, the total would be 1,563,538 tons of average grade of 9 dwt. At this grade the gold produced would be 703,592 oz., and the bonus £703,592. A doubled population would be 64,082. That population, at £8.6 per head, would pay to the commonwealth £551,105 in taxation. The difference, as before, representing the net commonwealth subsidy to the industry would be £152,487. In the chamber's opinion this would eventually be the maximum difference, for it is improbable that, where ore is treated in quantity, the average grade will not exceed 9 dwt.

Benefit to Entire Commonwealth

We leave it to the commission to assess what the value of 703,592 oz. of gold for commonwealth banking purposes would be; what would be the value of an extra mining population of 32,082 as a market to the secondary industries of the commonwealth, and what would be the value of the difference of £152,487 in immigrant attractive power. We draw attention to the fact that production of gold does not harm other industries, but on the contrary, it greatly assists all of them. There is also no fear of overproduction.

We do not wish to make invidious references to what almost all of the primary and secondary industries in the commonwealth receive as assistance in one form or another, but we claim with some confidence that those of equal importance to gold mining do not directly or indirectly return to the commonwealth so large a proportion of the assistance they receive as our industry would return under the stimulus of the proposed gold bonus.

The bonus would avert the huge loss of £8,000,000 of commonwealth, state and private property. Depreciation would greatly exceed £152,487 per annum. As the ore—quantities of it—is available it becomes a matter of serious consideration whether this depreciation alone does not justify the granting of the bonus.

We might claim that a flourishing and progressive gold-mining industry is, from the point of view of employment, of very great value to both commonwealth and state, for two reasons. First, it employs a far larger number of men in proportion to the value of its output than any other primary industry; and second, it therefore pays in wages to its employees a greater proportion of the value of its product. Of the total value of the gold produced just about half is paid away directly to the mine workers. The gold-mining companies of only Kalgoorlie and Boulder pay in wages to their employees the sum of £750,000 per annum.

The members of the chamber have considered very carefully various methods suggested for the distribution of the bonus payment, and have come to the conclusion that the simplest and best method is that of payment by results—that is, 20s. per ounce of gold actually produced. We should be glad if we could recommend payment on a tonnage basis, or if we could advise that the whole bonus payable on 12 dwt. ore should be paid on the first 6 dwt. only. But we decided that both these methods would be impracticable, and might very easily lend themselves to fraud. The first is eminently practicable, and with it no fraud is possible. The only way in which the bonus might be abused would be by securing sovereigns and adding them to the gold return, but unless the commonwealth again puts sovereigns into free circulation there is little cause for fear.

The bonus of 1s. per pennyweight would mean that the very few men or companies producing high-grade ore—1 oz., or 2 oz., or even 3 oz.—would greatly benefit, but the total amount they would receive would be a very small fraction of the whole bonus payment. On the other hand, it would have a very stimulating effect on prospectors. The owners of small, rich mines would be proportionately the greatest gainers. We cannot conceive a greater prospecting stimulant. New mines are most likely to be found far distant from railways, and the extra high returns from rich ore would greatly assist the finder to work them profitably. The payment of the bonus would induce large numbers of men to go out prospecting; and, incidentally, would save the state a considerable part of the yearly sum it now pays to encourage prospectors.

Want 20s. per Ounce

In conclusion, we would urge that, if the commonwealth government decides to restore the gold-mining industry by means of a bonus, it should not do it in a half-hearted way. To pay less than 20s. per ounce would, in our opinion, not be sufficiently effective, for it would not make available for profitable working a sufficient quantity of low-grade ore. The payment of 20s. per ounce would bring about a real revival of the industry; and we sincerely believe that in the expansion of gold mining, in its attraction of immigrants from abroad, in its decentralizing effects, and in the capital it would certainly bring into Australia for investment, the commonwealth would find in two or three years that it was spending the bonus money to excellent purpose and obtaining for it a very substantial return. Besides, if the commonwealth agreed to give a bonus on the gold produced for a period of ten years and then found that it had a too stimulating effect, it has in its hands the remedy of corrective taxation.

Chemical Exposition Dinner Arranged

A chemical industry dinner with 1,200 in attendance and with General Pershing as the chief speaker is being planned for the week of the Chemical Exposition in New York, Sept. 28 to Oct. 3. The Chemical Warfare Service Association, of which Dr. Charles H. Herty is president, has started the movement and sent invitations to other associations to join in the dinner.

Dearth of Iron-Ore Removes Japan as War Menace

C. K. Leith Points Out Limited Resources of Far East—Fatal to Military Operations

Japan in not a serious menace to world peace, because of the dearth of mineral resources, particularly iron ore in the Far East, according to statements made by Prof. Charles K. Leith, of the geology department of the University of Wisconsin, in a conference on mineral resources as a factor in world affairs, before the Institute of Politics recently in session at Williamstown, Mass. Professor Leith said in part:

"The discussion of Japan as a formidable power is based on misapprehension of the facts. It seems incredible that Japan could consider war on a large scale, because of her lack of one of the main sinews of war, steel. It seems impossible that she could keep the way open to any one of the three great centers, especially if she were at war with any one of the countries which control them. Japan is woefully weak in this main sinew of war and knows it.

"It is in iron ore that Japan is most lacking. This is fatal to any large-scale militaristic schemes she might ever entertain. There are two possible sources of supply, China and the Philippines. Though many people suppose that Japan is turning her eyes toward the 400,000,000 tons of ore in the Philippines, this is a small amount in the world scale, and the grade of ore and its relation to the coal supply, as it is not good grade, make it questionable that a large steel center could develop from it. Yet it is undoubtedly an outstanding fact of the Eastern situation.

" 'With regard to Chinese ore,' Dr. H. F. Bain, former director of the United States Bureau of Mines, said, 'there are only between 300 and 400 million tons of iron ore in a single deposit, and the opportunities for development of iron and steel on a large scale in China and from these ores is not encouraging.' "

Dr. Leith concludes that all this tends "to contradict decisively the theory that the East is going to be the center of civilization in the future. Elsewhere it is otherwise. Europe had a reserve supply of 17 per cent of the world's coal, and was turning out 54 per cent of the world's supply."

British Institute of Metals Meets

The annual autumn meeting of the Institute of Metals will be held in Glasgow, Sept. 1 to 4. On Sept. 1 Sir John Dewrance will lecture on "Education, Research and Standardization." The mornings of Sept. 2 and 3 will be devoted to the reading and discussion of sixteen papers dealing with many aspects of metallurgical work. In the afternoons visits will be paid to works in the Glasgow district and in the evening of Sept. 2 a reception is to be given by the Lord Provost and Corporation of Glasgow. The concluding day of the meeting, Sept. 4, is set apart for a visit to the Trossachs and Loch Lomond.

Men You Should Know About

George W. Lambourne, mining operator, of Salt Lake City, is visiting in San Francisco.

John D. Ryan, chairman of the Anaconda company, who returned recently from Europe, has gone to Houghton, Mich.

M. K. Campbell, Jr., superintendent of Minas del Tajo, at Rosario, Sinaloa, Mexico, is on a short visit to San Francisco.

C. B. Lakenan, of McGill, Nev., general manager of the Nevada Consolidated Copper Co., is in San Francisco on a short visit.

John T. Lonsdale has been appointed associate geologist in the bureau of economic geology and technology of the University of Texas, at Austin.

Nelson Dickerman, mining engineer, of San Francisco, returned recently from a mine examination trip in the Alamo district, Lower California.

H. A. Poillon, of Poillon & Poirier, New York mining engineers, is at the property of the Valley Mines Co. near Wabuska, Nev., on his annual visit.

J. A. Burgess, mining engineer, of San Francisco, has returned from a mine examination trip in Utah and is now on his way to Seward, Alaska.

George A. Packard, mining engineer, of Boston, has just concluded the examination of mining properties in Montana and was a visitor in Butte last week.

Du Relle Gage, mining engineer, who is engaged in developing mining properties in Chile, is in New York for a couple of months. His New York address is 115 Broadway.

Charles Huntzinger, mining engineer for the Johannesburg office of the Robins Conveying Belt Co., is visiting in London on his way back to the Rand after a four months' visit to the United States.

H. C. Cooke, of the Canadian Geological Survey, will make an examination of the gold and copper deposits in the Rouyn area of northwestern Quebec to determine their character and geological relationships.

J. A. McLaughlin has been appointed superintendent of the Copper Mountain mine and **Harry Smith** has been appointed superintendent of the Allenby mill by the Granby Consolidated Mining, Smelting & Power Co.

N. J. Evered has been appointed manager of the Crown Reserve property in Larder Lake. The company purposes to do a substantial amount of diamond drilling and in the meantime will cut down on underground work.

Prof. U. S. Grant and **John T. Stark,** of the department of geology and geography of Northwestern University, Evanston, Ill., are at present conducting a geological field course devoted largely to a study of pre-Cambrian formations in Minnesota and Ontario.

George Dawe, former chief clerk of the Calumet & Arizona smelter at Douglas, has been appointed smelter superintendent, succeeding Harry A. Clark, who took over the duties of general manager on the resignation of General John C. Greenway.

Don M. Rait, for the past five years assistant mine superintendent for the Calumet & Arizona Mining Co., has been promoted to the mine superintendency, to fill the vacancy caused by the promotion of E. E. Whiteley to be assistant general manager of the company.

R. B. Van Buskirk, formerly mine superintendent for the Santiago Mining Co. at Santiago, Chile, has accepted

R. B. Van Buskirk

a similar position with the Andes Copper Mining Co. at Potrerillos, Chile.

L. J. Weeks, of the Canadian Geological Survey, will accompany the annual Canadian Government expedition to the Arctic region to examine the geological formations, more particularly with regard to occurrences of valuable minerals, including the coal seams north of Baffinland.

Walter E. Cameron, for many years on the Geological Survey of Queensland, Australia, afterward for three years government geologist in the Malay States, and later for a time in London, has returned to Australia, and is now in private practice as a consulting geologist in Melbourne. Mr. Cameron was deputy chief of the Queensland Geological Survey when he resigned from that survey to go to the Straits. His appointment at that place was for three years, at the end of which time the government, for the purpose of economy, abolished the position he had held.

Colonel Henry H. Armstead, accompanied by **Felix E. Wormser,** arrived in Vancouver recently after an inspection of the Gleaner mine in the Atlin district of British Columbia. From Vancouver they departed for Kalso, B. C., where Colonel Armstead is developing the Utica mine with a large tunnel, which it is expected will cut the east and west Utica veins 1,800 ft. on their dip.

J. C. Brumblay, with the permanent closing of the Mammoth Copper smelter in California about August 1, completed seventeen years of service in the smelting department of U. S. Smelting, Refining & Mining Co. The final ten years of this engagement have been occupied in the Western mining fields as ore buyer and field representative for the Mammoth and Midvale, Utah, plants with headquarters in Salt Lake City and Reno, Nev. He will continue work begun early in the year for the Mason Valley Mines Co. in preparation for the resumption of smelting at its Thompson copper plant near Wabuska, Nev.

Obituary

George Stahl, of Golconda, Nev., was killed in an accident at his ranch near Golconda on July 28. Mr. Stahl was a well-known mining man who achieved considerable attention by his successful operation of the Buckskin National mine. The Stahl brothers made the original strike at the National mine in Nevada. He leaves a widow and a five-year old daughter. He was interested in mining properties in the Masonic district near Stillwater and owned a large ranch near Golconda.

Joseph F. Dierdorff, works manager and engineer for the Jeffrey Manufacturing Co. and one of the best known authorities on mining and conveying equipment, died at French Lick recently at the age of 49 years. He recently underwent an operation for appendicitis and was apparently recovering. Bright's disease, from which he had been suffering for some time, caused his death. He started with the Jeffrey Manufacturing Co. when thirteen years of age and for the past fourteen years had been works manager and chief engineer.

Jay Backus Woodworth, professor of geology in Harvard University and director of the seismological department at the university since 1908, died at his home in Cambridge, Mass., on Aug. 5, after a long illness. Professor Woodworth had been connected with the faculty of Harvard for more than thirty years. He was also affiliated with the U. S. Geological Survey for southeastern Massachusetts. He had also served as a member of the committee on geology and paleontology of the National Research Council and was at one time chairman of the sub-committee of that body on the use of the seismograph in war. He served as first vice-president of the Geological Society of America in 1921 and had formerly been counselor of the body. In 1916-18 he was president of the Seismological Society of America. He was a member of the American Society of Arts and Sciences, Washington Academy of Science, and Boston Society of Natural History. Professor Woodworth was the author of monographs and papers on glacial formations and other geological and paleontological topics.

Recent Technical Publications

Reviews, Abstracts, and References

Mining Journal-Press does not publish books, nor does the McGraw-Hill Co., a separate organization known as the McGraw-Hill Book Co., 370 7th Ave., New York City, taking care of that part of our publishing activities. We are therefore turning over to that company the following communication:

"Dear Sir, send if you please a free copy of The marketing of metals and minerals recently published by your publishing house to the *Literarische Wochenschrift*. The *Literarische Wochenschrift* is properly and really the spirituous continuation of the late Prof. Friedrich Zarncke's *Literarisches Zentralblatt*, edited by Prof. Eduard Zarncke son and supported by nearly 500 professors and other learned men of scientifical reputation in the world. We do you warant a competent review as quickly as possible by scientifical authorities. The *Literarische Wochenschrift* is the most respectable weekly journal of scientifical knowledge and literatural review throughout the world for every learned man and so likewise a firstclass propaganda-journal for all publishers and booksellers on the whole.

Yours truly,

Redaction of

Literarische Wochenschrift."

Had we as much knowledge of German as this writer had of English, we might follow the example of Mark Twain and translate this back into German. Incidentally, a second printing of "The Marketing of Metals and Minerals" is about to be made.

European Finance—Another volume of the findings of the Commission of Gold and Silver Inquiry of the U. S. Senate on the subject of European currency and finance has recently been issued. This is known as Vol. 2, Serial 9, "Foreign Currency and Exchange Investigation," by John Parke Young, and may be obtained from the commission, U. S. Senate, Washington, D. C., on request. This is a continuation of Vol. 1 and gives a description of pre-war currency systems in twelve European countries, an account of war and post-war developments, and a discussion of efforts toward financial reconstruction. Another printing of Vol. 1 has been made, and it can be obtained for 80c. from the Superintendent of Documents, Washington, D. C.

Uganda—The annual report of the Geological Survey Department of Uganda Protectorate for 1924 has been issued, briefly summarizing the year's work. It may be obtained on request from the director, Geological Survey, Entebbe, Uganda.

Federated Malay States—The annual report of the Chief Secretary of the Federated Malay States has recently been issued and is obtainable from the Government Printing Office, Kuala Lumpur, on request. Tin is the principal mining product, export of tin ore reduced to a metallic basis amounting during the year to 44,043 long tons, compared with 37,490 in 1923. Details of the completion of the sales under the Bandoeng Conference agreement are given. Though the price realized for the stock of tin was greater than was paid for it, storage and interest charges more than made up the difference, so that the government wound up with $2,617,000 in the red, $1 in that part of the world being the equivalent of 57c., U. S.

Mine Haulage—A bulletin on "Haulage," by Adam Crawford, has recently been published by the Department of Mining Extension, West Virginia University, Morgantown, W. Va., as a part of the extension study course in coal mining. The book is of 115 pages, and includes chapters on mine cars, resistance to haulage, gasoline and electric locomotives, gathering haulage, rope haulage, animal haulage, mine tracks, aërial tramways, and haulage ropes. Much practical information and many informative illustrations are included in this booklet.

Cadmium—"Cadmium in 1923-1924," by C. E. Siebenthal and A. Stoll, has been issued by the U. S. Geological Survey, Washington, D. C., as part of the "Mineral Resources" series (5 pp.; obtainable on request). Cadmium production in the United States was only 129,328 lb. in 1924, compared with 183,916 lb. in 1923. Tasmania, the only other important producing country, increased from 275,518 lb. in 1923 to 356,345 lb. in 1924, to which may be attributed the drop in price.

Mine Fires—"Small Hose Streams for Fighting Mine Fires" is the title of U. S. Bureau of Mines Technical Paper 330, by L. D. Tracy and R. W. Hendricks. The bulletin gives the results of tests made to ascertain the equipment and pressures with which an average man, without assistance, could fight a mine fire most effectively. It was found that a 1½-in. cotton rubber-lined hose was as large as is desirable, used with a water pressure around 45 lb. per inch, and with a ¾-in. nozzle. Copies of the bulletin, which is of 23 pages, are obtainable from the Superintendent of Documents, Washington, D. C., for 10c.

South Dakota Mining—The report of the South Dakota State Mine Inspector, for the year ended Dec. 31, 1924, 32 pages, has recently been issued and is obtainable on request to the State Mine Inspector, Lead, S. D. The Homestake produced more than $6,000,000 worth of gold, the entire mineral production of the state aside from that of the Homestake amounting to only about $600,000, principally quarry rock.

Switchboards—The General Electric Co., Schenectady, N. Y., has published an exhaustive manual of 120 pages, on the installation, operation, and maintenance of switchboards, copies of which will be sent on request.

Sulphur Burning — *Chemistry and Industry* for July 3 and 10 contains the first installments of a continued article on "The Combustion of Sulphur-Containing Materials in Hand and Mechanical Burners," by P. Parrish. The author discusses principles of design, and has illustrations of the Humphries, Parrish, Wyld, Newton Chambers, Herreshoff, and Wedge furnaces. Equipment for both sulphur and pyrites burning is considered. Copies are obtainable for 1s. 9d. each, from the Society of Chemical Industry, Central House, 46 Finsbury Square, London, E. C. 2.

Mineral Resources — "Quicksilver in 1924," 7 pages, by Clyde P. Ross; "Tin in 1924," 3 pages, by Bertrand Leroy Johnson; and the summary of "Mineral Resources of the United States, 1922," Part 1, Metals, by G. F. Loughlin, have recently been issued and are obtainable on request from the U. S. Geological Survey, Washington, D. C. Quicksilver production increased from 7,937 flasks in 1923 to 10,061 in 1924, California being responsible for the larger production. Tin mine production in 1924 was almost four times as great as in 1923, being 7 tons, compared with 1.9, all from the Hot Springs district of the Tanana region, Alaska.

Ontario Mining—Part 7 of the thirty-third annual report of the Ontario Department of Mines, 138 pages, gives summarized reports of operations at all the active mining properties in the province, with the names of officials. Chapters are also appended on "Hydro-Electric Development for Gold and Silver Mines in Northern Ontario," and "Distribution of Electric Load at the McIntyre Mine." Copies are obtainable on request to the Ontario Department of Mines, Toronto, Ont.

Explosives—Technical Paper 380 of the U. S. Bureau of Mines gives data on the "Production of Explosives in the United States During 1924," with notes on mine accidents due to explosives. It is by William W. Adams. Copies are obtainable from the Superintendent of Documents, Washington, D. C., for 5c.

Concreting a Shaft—"The Concreting of the Porphyry Shaft" of the Inspiration Copper Co. is discussed in a 5-page article by William G. Webber in the *Arizona Mining Journal* for July 30 (Phoenix, Ariz.; price 20c.)

Approved Mining Equipment—U. S. Bureau of Mines Technical Paper 376, 35 pages, by J. E. Crawshaw, L. C. Ilsley, D. J. Parker, and A. C. Fieldner, is entitled "Permissible Explosives, Mining Equipment, and Rescue Apparatus Approved Prior to Jan. 1, 1925." Obtainable from the Superintendent of Documents, Washington, D. C., for 5c.

Economic Geology — *Economic Geology* for August contains the following articles: "Correlation of Oil Sands by Sedimentary Analysis," 15 pages, by A. C. Trowbridge and M. E. Mortimore; "Magnetite Segregation in Banded Syenite in Minnesota," 7 pages, by F. F. Grout; "Relationships in Mineral Deposits of Northwestern Manitoba," 11 pages, by R. C. Wallace; "Pyrophyllite Deposits, Deep River Region of North Carolina," 22 pages, by J. L. Stuckey; "Geology and Location of Dams on the Canadian River, Texas," 6 pages, by L. T. Patton; and "Mechanism of Replacement and Recrystallization," 15 pages, by E. E. Fairbanks. (Economic Geology Publishing Co., Lancaster, Pa.; price 65c.)

New Machinery and Inventions

New Ore Bridge Has Patented Tractor Drive

The New York Central Railroad has recently put a new Brownhoist ore bridge into service at its No. 1 dock at Ashtabula Harbor, Ohio. This bridge replaces one blown down in the storm of last summer and incorporates several interesting features, among them a patented tractor drive for traveling the bridge and holding it in wind storms.

The concrete walls that form the foundations for the bridge structure are 1,080 ft. in length and are spaced 287 ft. 9 in. center to center. Hundred-pound rails are used for the four tracks, and these are gaged 4 ft. 8½ in.; the tops of the rail heads have an elevation of 17.145 ft. The height from the track rails on the foundations to the top of the trolley track rails is 71 ft. The overall length of the bridge is 632 ft. 5 in., and the trolley travel is 585 ft. 3 in. The Brownhoist ore grab bucket is of 160-cu.ft. capacity and is rated at 13 tons. In basic ore it has in several instances picked up as much as 22 tons and averages 18 tons in the same ore. Figuring ore at 16 cu.ft. per ton of 2,240 lb., the bridge serves a storage capacity of about a million and a quarter tons.

The new Brownhoist bridge has thirty-two truck wheels, sixteen under the pier trucks and sixteen under the shear trucks, all of which are idlers. The bridge is driven along the dock by means of two tractors, one of which is set into each leg of the bridge, and these travel on the same tracks as the bridge, although they are in no manner attached to it. Each of these tractors has eight idler wheels and huge cast-steel driving gear that meshes with a rack extending the entire length of the dock. The racks are made up of 9x2-in. bars, 39 ft. 8¼ in. long and spaced 11¾ in. apart, with 4-in. drawn-steel pins at 9-in. pitch for teeth. These racks are laid between pier and shear track rails. The bars are anchored to the foundations at their centers, which make the anchorage 39 ft. 9 in. apart. The bars are further supported at the spliced joints and at the extreme ends of steel chairs. The total length of each rack is 1,033 ft. 6 in.

The tractors, weighing 90 tons apiece, are each made of two pairs of trucks and have bodies or rectangular frames connected to the trucks by ball-and-socket connections. Each tractor is equipped with two independent driving units that are coupled together by means of jaw clutches. One driving unit per tractor is sufficient to hold or drive the bridge-crane, but the second driving unit was installed on this bridge as a precautionary measure. Each driving unit consists of a 100-hp. motor geared to a bull pinion by means of a worm on the motor shaft and spur gears down to the bull pinion shaft. The bull pinions are 71.625 pitch diameter, 9-in. circular pitch on 10-in. face and weigh 4 tons each. Solenoid brakes add to the efficiency of the worm gear holding power.

The pier and shear sill construction for a bridge of the inclosed tractor type must, necessarily, be designed to accommodate the tractors. In consequence, they are substantially arch shaped with inward strutlike projections against which the tractor-frame abuts. There is only ⅛ in. play between the ends of the tractor frames and the projecting struts on the bridge.

There are several advantages gained by using separate tractors as a means for propelling a bridge along its runway. One of these is quicker delivery, because the bridge structure may be entirely erected without delays and the tractors installed in their designed places after the bridge proper has been completely erected. Also, the tractors are entirely shop built and a better mechanical job is assured.

Secondly, when the bull pinion driving mechanisms are built right into the bridge, as has previously been done, the bull pinions cannot at all times mesh properly with the racks on the foundation, because of the irregularities in the foundations. To illustrate: when the bridge sills span depressions in the rack and trackways, as for example the chord of an arc, they will be farther away from the track and racks at the center portions where the bull pinions are mounted than at the ends which are near the trucks. Consequently, the bull pinions will be lifted out of an accurate mesh with the rack, and conversely, when there is a hump in the rack and trackways between the trucks, the bull pinion will project too far into the rack. As the center to center of the trucks on the tractors is much less than the center to center of the sill-mounted bridge crane trucks, this condition will be minimized to a negligible extent on the tractor drive.

Most bridges are adapted to skew because the propelling elements do not drive the pier and shear trucks at a uniform speed. When either end of the bridge is advanced over the other, the bridge span has skewed relation to its pier and shear supports, and this results in the shear legs tilting inwardly at the top, toward the pier. Because the sill is a component and integral member of the shear support, it will likewise be out of plumb, as will also any mechanisms that are attached to it. When separate tractors are employed for driving, the skewing of the bridge will have no effect on the mesh of the bull pinion and rack teeth, because the tractor is not fastened to the bridge, and will at all times retain its normal relation to the rack and foundations.

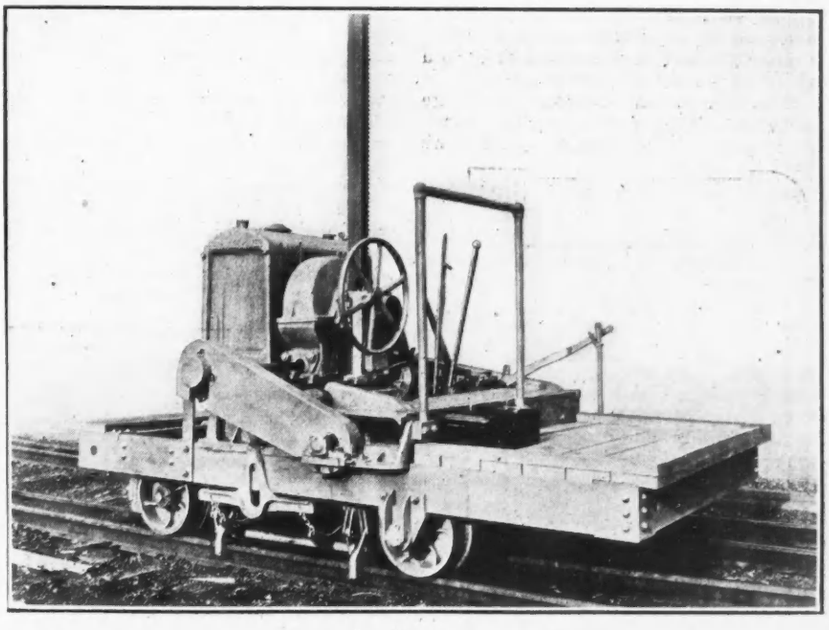
Peterson Track-Shifting Machine Now Made by Nordberg

The track-shifting machine patented by Ernest E. Peterson, the operation of which was described on page 307 of the *Mining Journal-Press* of Aug. 18, 1923, is now being made under license by the Nordberg Manufacturing Co., Milwaukee, Wis. Features of its construction, as it is turned out in the Nordberg shops, are as follows:

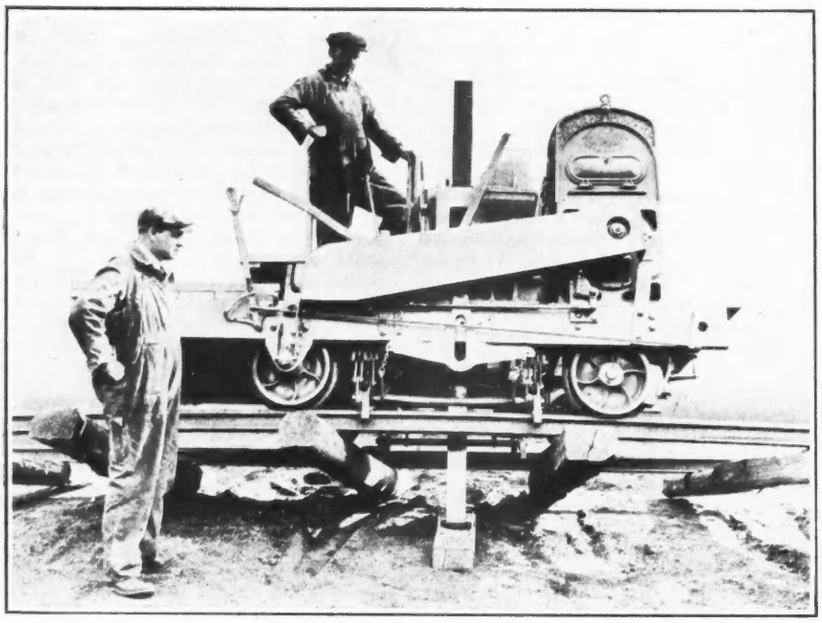
The frame is made of heavy steel channels securely riveted together. Cast steel is used instead of cast iron for all parts subject to excessive strain. The power unit is 40-hp. four-cylinder, and fully inclosed. The worm and gear supplying power to the spud are of liberal proportions so as to assure long life and minimum wear. They run in an oil-tight case with 3 in. of oil above the worm and its roller thrust bearings.

The transmission gearing is equipped with full roller bearings throughout. Hardened nickel steel gears with 1½-in. face run in an oil bath inclosed in an oil-tight case.

Track wheels have wide chilled faces and run on roller bearings. All controls and levers are within easy reach of the operator. The brakes on the



This track-shifting machine has a 40-hp. power unit and is strongly made



Track-shifting machine in operation

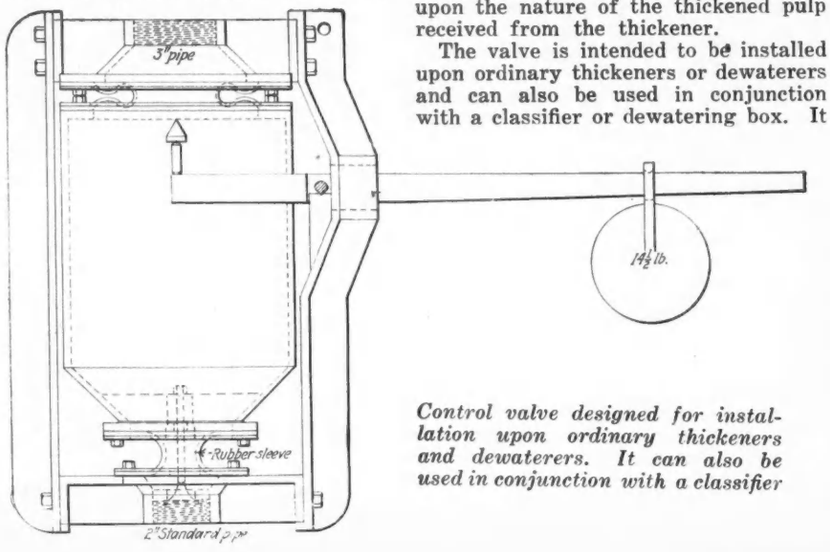
transmission automatically set when spotting the spud foot piece between the ties. Brakes are also supplied on the front wheels. The standard automotive clutch forward and reverse is used.

The lifting speed of the spud is 22½ ft. per minute. Where track must be thrown over hard or rough ground, this rapid lifting speed is of vital importance in order to get a wide shift. The length of the machine is 10 ft., width 7 ft., height 8 ft., length of spud 8 ft., weight 8,300 lb.

Thickener Control Valve

A new type of valve, known as the Bradley automatic density valve, has been designed and is being placed on the market by the Thyle Machinery Co., of San Francisco. The valve is intended to be used wherever a crushed or other product is suspended in a fluid and is to be settled or thickened. It is attached to the bottom discharge pipe of a thickener or other tank used for removing the surplus fluid. As shown in the accompanying illustration, the important feature is a cylindrical vessel of 600 cu.in. volume, which is drawn in at the bottom to a funnel-shaped discharge. The vessel is attached to flanges, above and below, by a flexible rubber sleeve that allows it to move in a vertical direction within relatively small limits of travel. The vessel is maintained in equilibrium by a lever arm and attached weight, which can be shifted along the lever arm. In the bottom of the vessel, an inverted mushroom or cone-shaped valve is attached to a crossbar. This valve seats against the under side of a flat plate in which is set the discharge opening. The movement downward of the vessel opens the valve and allows the thickened product to escape. As the vessel is counterbalanced, any increase in weight opens the valve. When the weight of the thickened product decreases, the counterweight lifts the vessel and closes the valve. The device is automatic, once the weight has been adjusted in position. An intermittent or continuous flow results depending upon the nature of the thickened pulp received from the thickener.

The valve is intended to be installed upon ordinary thickeners or dewaterers and can also be used in conjunction with a classifier or dewatering box. It is also of use in maintaining a constant tailing level in flotation cells. In countercurrent decantation, the valve will enable a constant density in the discharge.

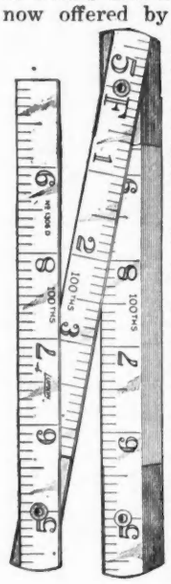


Control valve designed for installation upon ordinary thickeners and dewaterers. It can also be used in conjunction with a classifier

A valve of this type was installed at the Clio mine, taking the pulp discharge of ten stamps. The pulp entered the tank at a density of 18 per cent solids and was discharged by the valve to the tube mill at a density of 56 per cent solids by weight. A test made with the valve upon a product composed of 50 per cent glass sand (80 mesh) and 50 per cent calcium sulphate and carbonate mixed with water to a density of 8 per cent solids showed that a density of 61 per cent solids by weigh could be obtained.

Folding Aluminum Rule Graduated in Tenths

A folding aluminum rule graduated in tenths and hundredths of a foot is now offered by the Lufkin Rule Co., Saginaw, Mich., supplementing its line of aluminum rules in inch marking. The rule is designed to meet the needs of civil engineers, surveyors, and highway builders, and will appeal to others in related lines of work. As its opposite side bears the common graduation, feet, inches and sixteenths, the rule is suitable for all ordinary measuring. Graduations begin at same end on both sides, so a measurement in tenths can readily be converted into terms of inches, and vice versa. The rule is made in 6-ft. length with 6-in. sections.



Trade Catalogs

Mine Locomotives. Vulcan gasoline locomotives for switching service, featuring 16- and 20-ton sizes, class GS-16 and HS-20. Bulletin 102, 8 pp. Vulcan Iron Works, Wilkes-Barre, Pa.

Electrical Supplies. The Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., is distributing its new 1925-27 Catalog of Electrical Supplies, which presents the complete line of apparatus made by the company or obtainable through its district offices or agent jobbers, and gives detailed information on electrical supplies.

The publication, which contains 1,200 pages and is profusely illustrated with 4,500 engavings, lists all new apparatus designed and manufactured in the past two years, as well as all the previous established types. Four indexes for the convenience of the user have been included in the catalog. A complete subject index is printed on blue paper so that it can be quickly found, and a style number index for checking invoices is located in the back.

The Market Report

Daily Prices of Metals

Aug.	Copper N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
6	14.375	57.75	59.25	8.85	8.90	7.55
7	14.375@14.625	57.75	59.25	8.85	9.00	7.575
8	14.50	57.75	59.25	8.95	9.10	7.575
10	14.475@14.625	57.50	59.00	9.00	9.15	7.575
11	14.50@14.75	57.25	58.75	9.05	9.25	7.55@7.575
12	14.45	56.625	58.00	9.05	9.25	7.55
Av.	14.500	57.438	58.917	8.958	9.108	7.565

*The prices correspond to the following quotations for copper delivered: Aug. 6th, 14.625c.; 7th, 14.625@14.875c.; 8th, 14.75c.; 10th, 14.725@14.875c.; 11th, 14.75@15c.; 12th, 14.70c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

The quotations are arrived at by a committee consisting of the market editors of *Mining Journal-Press* and a special representative of the Bureau of Mines and the Bureau of Foreign and Domestic Commerce.

London

Aug.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
6	62 5/8	63 5/8	67 3/4	263 3/4	266 1/4	37 3/4	36 3/4	36 9/16	36 3/16
7	62 3/4	63 3/4	67 3/4	264 1/2	266 3/4	37 5/8	36 5/8	36 1/2	36 3/8
10	63 1/4	64 1/8	68 1/4	262 1/2	265 1/8	37 5/16	36 1/4	36 5/8	36 1/8
11	63	64	68 1/2	261 1/2	264	37 1/8	35 15/16	36 7/16	36 1/16
12	62 3/8	63 3/8	67 3/4	258 1/2	261 1/4	36 15/16	35 11/16	36 1/4	35 13/16

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

Aug.	Sterling Exchange "Checks"	Silver		Gold London	Aug.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
6	4.85 1/8	69 1/2	31 15/16	84s11½d	10	4.85 1/4	69 3/4	32 1/16	84s11½d
7	4.85 1/4	69 5/8	31 15/16	84s11½d	11	4.85 1/4	69 7/8	32 1/8	84s10½d
8	4.85 1/4	69 5/8	32	...	12	4.85 1/4	69 7/8	32 1/16	84s10½d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-half cent premium.

Copper and Lead Prices Advance Further

New York, Aug. 12, 1925—The nonferrous metal markets were not so active this week as last, but a good business was done nevertheless, particularly in copper, which advanced to new high levels for the current movement. Lead also advanced, though buying continues to be restricted by the extremely limited offerings. Zinc has been in only fair demand, though the price is well maintained at above 7½c. and stocks have recently been reduced, being less than two weeks' supply. Silver has been firm and steady between 69 and 70c., with no unfavorable factors in prospect. Tin has been quiet all week.

Copper Touches 15c.—in the Middle West

Last Thursday, practically all copper sellers asked 14⅝c., but by Saturday all offerings at this price had been taken up and 14¾c. had been firmly established for deliveries to Connecticut points. A fair tonnage was also sold as high as 14⅞c. for the Middle West on Friday. On Monday, 14¾c. was shaded slightly for early deliveries to nearby points, but again a good business was done in the Middle West at 14⅞c., and on Tuesday the long-anticipated 15c. was realized on more than 1,000 tons in that market. In the East, 14⅞c. has been the top so far, and even that figure has been unobtainable today, though some, at least, of the large producers continue to quote it. The weakness in London has brought out some of the speculative holdings, and freer offerings have been made by the smaller sellers, so that today 14¾c. delivered may be considered a top price, which there has been a tendency to shade to some extent for resale lots.

The volume of sales for the week has been above normal, though not so large as a week ago. Brass and wire mills have been large buyers, and have placed orders for positions for which they had previously indicated they were well booked. This seems to signify that some good orders have been coming in for fabricated articles lately, and in fact, they freely admit that August business has been better than expected.

The export market has been rather quiet at the advanced prices. American agencies are quoting 14.95c., c.i.f., today, but have not yet sold much at that price. English dealers have been actively in the market for copper during the week and have taken up several small and cheap lots.

Copper for far-forward positions is somewhat firmer than nearby, though sellers have sold most of their offerings at a flat price, principally for September-October delivery.

Nominal Prices for Lead

The contract price for New York lead set by the American Smelting & Refining Co. was advanced from 8.75c. to 8.90c. on Saturday, Aug. 8, and to 9c. on Tuesday, Aug. 11.

The lead situation continues unchanged from last week, with the largest producers trying to prevent a runaway market, but with insufficient supplies with which to work. The large contract sales of the American Smelting & Refining Co. at its official contract price in the East have acted as a brake on the market, but in the Middle West the contract sales of the principal producer are at the average price and this producer has not sufficient lead to offer at fixed prices to be a controlling influence in the market. Without this explanation, the *Mining Journal-Press* prices might be misinterpreted, giving, as they do, a considerably higher price in St. Louis than in New York, whereas dealers' quotations are somewhat higher in the East than in the Middle West, though they are not far from 10c. in either market. Nothing of consequence has been sold at the fancy prices quoted in the East, but in the Middle West a few sales have been made up to 9.60c.

Zinc Practically Unchanged

Only a moderate tonnage of zinc was sold during the week, and that at practically unchanged prices of 7.55@

7.575c., St. Louis. The market continues on the export parity, a small amount being sold for foreign account each week. Statistics issued by the American Zinc Institute for July follow:

All companies. Tons of 2,000 lb.

Stock, July 1	22,906
Produced	47,583
Shipped	49,718
Stock, July 31	20,771
Shipped from plant for export	5,977
Stored for customers	150
Retorts operating July 31	82,140

The average daily production during July was the lowest since last November, and this, coupled with a heavier shipping rate than in three or four months, brought a reduction in stocks after the constant, though slight, increase that has been reported since January.

High-grade zinc continues in good demand at unchanged prices, 8½@8¾c., delivered.

Tin Quiet at 58c. Today

The tin market has been unusually quiet all week, and London prices since Friday have declined in consequence. From above 59c., the New York market has reacted to 58c. today, but buying does not seem to have been stimulated as it has been sometimes in the past with lower prices. The decline is not thought to be an important one. Forward positions are selling at about the same prices as spot metal, though concessions of ⅛@¼c. were made earlier in the week.

Silver Continues Steady

Silver continues steady, with China a moderate buyer at current rates and the Indian bazars as potential buyers at slightly below the present level. The market is steady, with New York offerings somewhat limited.

Mexican Dollars: Aug. 6th, 53½c.; 7th and 8th, 53⅝c.; 10th, 53⅜c.; 11th and 12th, 53¼c.

Exchanges Slightly Lower

The principal foreign exchanges are slightly lower than a week ago. Closing cable quotations on Tuesday, Aug. 11, were as follows: francs, 4.67c.; lire, 3.6125c.; and marks, 23.81c. Canadian dollars, 1/16 per cent premium.

Other Metals

Quotations cover large wholesale lots unless otherwise specified.

Aluminum—99 per cent grade, 28c. per lb.; 98 per cent, 27c. London, £118 per long ton for 98 per cent.

Antimony—

Chinese brands, spot, 18@18¼c. per lb.; September, 16¾@17c.

Cookson's "C" grade, spot, 19⅝@20c.

Needle and oxide nominally unchanged from quotations in the Aug. 8 issue.

Bismuth—$2.65@$2.70 per lb., in ton lots. London, 10s.

Cadmium—60c. per lb. London, 2s. 3d.

Iridium—$400 per oz. for 98@99 per cent. Nominal. London, £75.

Nickel—Ingot 33@34c.; shot, 34@35c.; electrolytic, 38c.; London, £170@£175 per long ton.

Palladium—$78@$83 per oz. Crude, $65. London, £16.

Platinum—$120 per oz. refined officially quoted. Sales also at $115@$118. Crude, $114. London, £25 per oz. for refined; crude £23.

Quicksilver—$82@$82.50 per 75-lb. flask. San Francisco wires $82.33. London, £14. Market very dull.

The prices of **Cobalt, Germanium Oxide, Lithium, Magnesium, Molybdenum, Monel Metal, Osmiridium, Osmium, Radium, Rhodium, Ruthenium, Selenium, Tantalum, Tellurium, Thallium, Tungsten** and **Zirconium** are unchanged from the Aug. 8 issue.

Metallic Ores

Manganese Ore—Per long ton unit of Mn, c.i.f. North Atlantic ports:

Brazilian, 42@44c.

Indian, 44c.

Caucasian (unwashed), 42c.

Caucasian (washed), 44c.

Tungsten Ore—Per unit of WO_3, N.Y.:

High-grade wolframite, $12@$12.50. Ordinary quality, $11.50 @ $11.75. Scarce.

High-grade Western scheelite, $12.50. Market fairly active for forward shipment on account of unsettled conditions in China.

Chrome, Galena and **Pyrite Radio Crystals, Iron Ore, Molybdenum, Tantalum,** and **Vanadium Ores** are unchanged from quotations in the Aug. 8 issue.

Sharp Advances in Zinc and Lead

Joplin, Mo., Aug. 8, 1925

Zinc Blende	Per Ton
High	$57.60
Premium, basis 60 per cent zinc	$56.00@$57.00
Prime Western, 60 per cent zinc	$54.00@$55.00
Fines and slimes, 60 per cent zinc	$53.00@$51.00
Average settling price, all	$52.61
Lead Ore	
High	$112.56
Basis 80 per cent lead	$120.00
Average settling price, all	$108.03

Shipments for the week: Blende, 19,606; lead, 1,447 tons. Value, all ores the week, $1,187,940.

Anxious buyers needing zinc ore began the week on $54 basis, and some Prime Western was sold on $55 basis today.

Producers are holding around 10,000 to 12,000 tons of lead ore for a still higher market. Buyers assert they want $140 basis. Lead sales and shipments have been very light since the price receded below $125 settlement basis.

Production is around normal, and about as heavy as possible except by increasing night operation.

Platteville, Wis., Aug. 8, 1925

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$52.00
Lead Ore	
Lead, basis 80 per cent lead	$115.00

Shipments for the week: Blende, 1,801 tons; lead, 40 tons. Shipments for the year: Blende, 28,745; lead, 1,268 tons. Shipments for the week to separating plants: 1,996 tons blende.

Non-Metallic Minerals

Amblygonite, Andalusite, Asbestos, Barytes, Bauxite, Beryl, Borax, Celestite, Chalk, China Clay, Diatomaceous Earth, Emery, Feldspar, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Greensand, Gypsum, Ilmenite, Iron Oxide, Lepidolite, Limestone, Magnesite, Manjak, Mica, Monazite, Ocher, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystals, Rutile, Silica, Spodumene, Sulphur, Talc, Tripoli, and **Zircon** are unchanged from prices in the Aug. 8 issue.

Mineral Products

Arsenious Oxide (White arsenic)—4c. per lb.

Copper Sulphate, Sodium Nitrate, Sodium Sulphate, and **Zinc Oxide** are unchanged from prices in the Aug. 8 issue.

Ferro-Alloys

Ferrotungsten—$1.125@$1.15 per lb. contained W.

Ferrocerium, Ferrochrome, Ferromanganese, Ferromolybdenum, Ferrosilicon, Ferrotitanium, Ferro-uranium and **Ferrovanadium** are unchanged from the prices in the Aug. 8 issue.

Metal Products

Rolled Copper—Sheets, 22¾c.; wire, 16½c. per lb.

Nickel Silver—29½c. per lb. for 18 per cent nickel Grade A sheets.

Yellow (Muntz) Metal—Sheets, 20½c. per lb.; rods, 17⅛c.

Lead Sheets and **Zinc Sheets** unchanged from prices in Aug. 8 issue.

Refractories

Chrome Brick, Firebrick, Magnesite Brick, Silica Brick, and **Zirkite** are unchanged from prices in the Aug. 8 issue.

Steel Prices Steady

Pittsburgh, Aug. 11, 1925

Steel ingot production decreased only 3.7 per cent from June to July, thus making a very favorable showing on the basis of expectations entertained last April, when production was decreasing sharply.

The Steel Corporation's unfilled obligations decreased by 170,991 tons during July, the loss being only half that shown for June. There was a small decrease in shipments and a considerably larger increase in bookings, making July the best month since April or March for bookings.

Consumption of steel appears to be distinctly heavy by any long range comparison, and not much below the rate of the first half of the year, and prospects are very good for its continuance. Steel prices are steady and on the whole make substantially as good a showing as six weeks ago.

Pig Iron—The market continues dull but quite firm; bessemer, $19; basic, $18; foundry, $18.50, f.o.b. Valley furnaces.

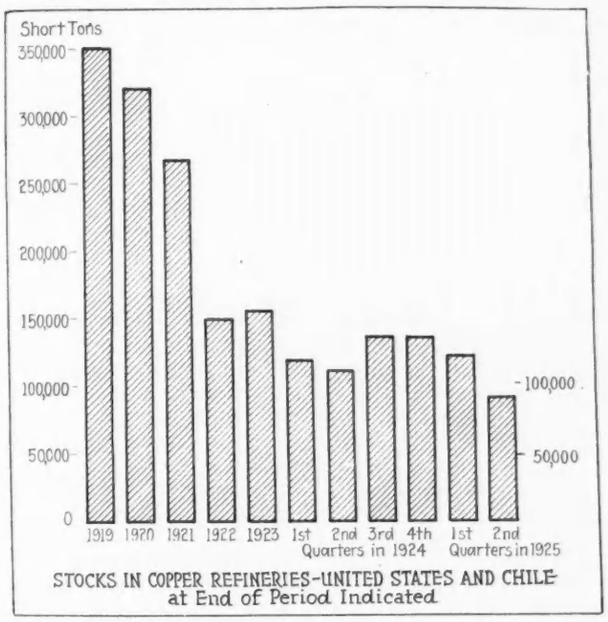
Connellsville Coke—The market is dull and steady, with some hope entertained there will be an extra demand on account of the prospective anthracite suspension. Spot furnace coke, $2.90; spot foundry, $3.75@$4.25.

Favorable Factors in the Copper Situation

By Arthur B. Parsons
Assistant Editor

SOMETIMES a set of reliable statistics demonstrates with seeming conclusiveness that a thing ought to be so; and yet stubborn fact proves the contrary. This is not true with the graphs on this page; they point to an improvement in the price of copper; and the price has been rising steadily from an average of 13.25c. in April to just under 14c. in July. At the moment it seems firmly established at 14.5c. in a market with apparently sufficient momentum to carry it still higher. The future price trend ought to be guided in large measure by the course taken by the statistics shown in the accompanying charts.

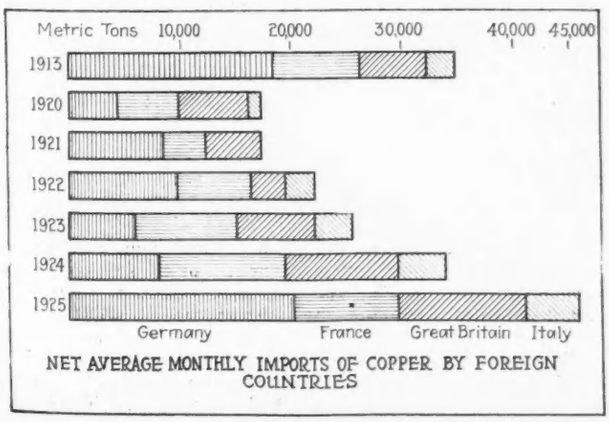
Refineries in the United States and Chile account for about 85 per cent of world production, so that the reaching of a new low level (91,326 tons), since the war, of stocks at these plants is highly significant. Shipments from these refineries, including foreign and domestic, averaged 123,000



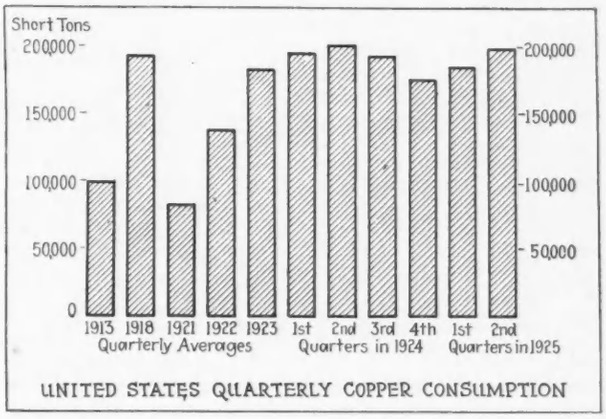
STOCKS IN COPPER REFINERIES-UNITED STATES AND CHILE at End of Period Indicated

tons per month during the second quarter of the current year, so that refined metal on July 1 represented only about twenty days' withdrawals—obviously a decidedly narrow margin and in sharp contrast to the stocks of 1919, 1920, and 1921.

The elements contributing to this situation are shown in the three other graphs. The net imports by the four principal foreign consuming countries represent the difference between total imports of refined raw copper and exports,



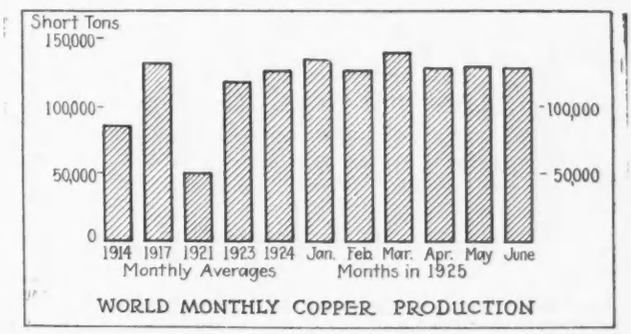
NET AVERAGE MONTHLY IMPORTS OF COPPER BY FOREIGN COUNTRIES



UNITED STATES QUARTERLY COPPER CONSUMPTION

including manufactures of all sorts. This gives a fair index to the rates of true consumption abroad. The figure for Great Britain is the average of six months, for France and Germany of five months, and for Italy of three months. It is likely that there has been some slowing down in the more recent months, but even so the rates exceed those of prewar 1913. Germany was buying in 1913 to equip battleships and manufacture munitions; today she is buying even more for peace-time consumption. A big project is the rehabilitation and extension of the government telegraph and telephone systems; and impressive progress in electrification of industrial plants is being made. The uncertainty arising from the threatened coal strike in Great Britain has put a damper on all industry, but that difficulty seems to be postponed, at least.

Opinions of well-informed observers as to the immediate future of copper in Europe are not unanimous. There are a few discordant voices among many optimists; but the preponderance of opinion seems to be favorable. The question is not one of will to buy, but the ability to finance purchases, which in turn hinges somewhat on the finding on export-



WORLD MONTHLY COPPER PRODUCTION

outlets for manufactures. However, any marked backward step seems unlikely.

In the United States, consumption during the first half did not quite reach that of the corresponding period a year ago, but it is generally predicted that the showing of the second half will be so good as to put 1925 ahead of both 1924 and the record year 1918. In June and July, normally dull months, an excellent domestic business was done by producers and the past fortnight has been unusually active, much of the business being for October shipment.

Some increase is expected in the rates of consumption by the makers of general electrical equipment. Public utility activity has expanded slowly but steadily, and industrial demand after a slight slump is again gaining momentum. Plans are in hand for the further displacement by electric motors of small steam installations as prime movers, and for expansion of distributing systems. The market for radio receiving sets is believed to be only scratched—though

perhaps well scratched—and to offer big and immediate possibilities, especially with lower prices for high-grade instruments.

Automobile manufacture, which absorbs more copper than any industry except the electrical, is expected to be stimulated by the increased sales induced by price reductions. Automobile sales in July are reported to be better than in any previous July and well-sustained manufacturing is forecast. Placing of orders for 2,000 tons last week by the Western Union company indicates steady extension of telegraph systems, and the Western Electric Co., which manufactures for the American Telephone & Telegraph Co., has been regularly in the market. Erection of buildings, particularly business and institutional structures, is surprisingly active; contracts let during the first half year are estimated to exceed the former high record by 15 per cent. Barring unforeseen developments, 1925 ought nearly, if not quite, establish a new high record in world consumption, providing the price is not allowed to soar skyward.

By their ability to regulate their individual rates of output, the producers are in a good strategical position. Since Anaconda settled down, in April—the settling down being attested by a reduction of about 3,000 to 3,500 tons in the monthly output of its own mines and those of its satellites—after the spree of production indulged in during the last quarter of 1924 and the first half of 1925, the world output has been nearly uniform, and apparently slightly less than consumption. During this period, as pointed out, the price for the metal has improved consistently from 13.25c. to 14.5c. The accompanying purely hypothetical calculation shows the philosophy that seems to have guided the production policy of some of the interests.

Income—10,000 tons @ 14.5c.	$2,900,000	
Cost—10,000 tons @ 10.0c.	2,000,000	
Profit		$900,000
Income—12,000 tons @ 13.25c.	3,179,000	
Cost—12,000 tons @ 9.875c.	2,370,000	
Profit		$809,000
Surplus profit on 10,000-ton basis		$91,000

In this illustration the average price for April and the current price today are used; and an increase of ¾c. per pound is allowed in the unit cost to compensate for the smaller production basis. Not only is an additional profit of $91,000 realized but 2,000 tons of copper is left in the imaginary mine for future production.

It is likely that the Kennecott-Jackling interests, which have been producing on a uniformly curtailed basis for eighteen months, as well as Anaconda would be averse to allowing the price to skyrocket. If the necessity should arise—as is by no means impossible—they have the means of averting such an event by the simple expedient of increasing their production. The most profitable course for all concerned would be a reasonably steady market, probably between 15c. and 16c., with a gradual increase in consumption up to the point where the present available plant, both for mining and ore reduction, of all the copper companies could be operated at maximum capacity. That that goal will ultimately be reached nearly everyone agrees, although it is probably three or four years away. Whether the industry stays on the broad highway leading thither or experiences numerous setbacks seems to depend pretty much on adherence to a common-sense program of production.

Company Reports

United Verde Extension Mining Co.

Copper; Arizona

Report of the United Verde Extension Mining Co. for the second quarter of 1925 shows the following copper production: April, 3,810,358 lb.; May, 3,625,252 lb.; June, 3,130,812 lb.

Liquid assets include:

Cash on hand, July 1, 1925	$1,188,532.10
Liberty bonds, par value $3,363,950—market value	3,421,276.65
U. S. Treasury certificates, par value $350,000—market value	357,060.03

The board of directors, at a meeting on June 18, declared a dividend of 50c. per share, payable on Aug. 1, to stockholders of record at the close of business July 6.

International Nickel Co.

Nickel; Ontario

Report of the International Nickel Co. for the second quarter of 1925 shows the following profit and loss statement:

Income

Earnings		$1,893,705.92
Other income		72,134.40
Total income		$1,965,840.32
Administration and general expense	$122,131.47	
Reserved for federal and franchise taxes	194,794.33	316,925.80
Net operating income		$1,648,914.52
Depreciation and depletion	$326,800.84	
Orford works property and shut-down expense	27,996.43	354,797.27
Profits		$1,294,117.25
Preferred dividend No. 79, payable Aug. 1, 1925		133,689.00
Balance		$1,160,428.25

Earnings in the corresponding period in 1924 were $845,655 and the balance was $226,009.

Balance Sheet as of June 30

Assets		Liabilities	
Property	$49,941,343.41	Preferred stock	$8,912,600.00
Investments	227,234.11	Common stock	41,834,600.00
Inventories	8,499,149.26	Accounts payable and tax reserves	1,330,151.25
Accounts receivable	2,755,011.66	Preferred dividend payable	133,689.00
Advances	88,021.89	Insurance and contingent reserves	541,812.69
Government securities	2,727,193.75	Surplus	14,299,571.69
Loans on call	1,400,000.00		
Cash	1,414,470.55		
	$67,052,424.63		$67,052,424.63

Utah Copper Co.

Copper; Utah

Report of the Utah Copper Co. for the second quarter of 1925 shows the total net production of copper from all sources in comparison with the output for the first quarter as follows:

1925	Net Pounds Copper Produced	Average Monthly Production
Second quarter	53,409,289	17,803,096
First quarter	53,708,632	17,902,894

During the quarter the Arthur plant treated 1,496,000 dry tons of ore and the Magma plant 1,607,200 dry tons, a total for both plants of 3,103,200 dry tons. The average grade of ore treated at the mills was 1.03 per cent copper and the average mill recovery of copper in the form of concentrates was 87.08 per cent of that contained in the ore, as compared with 1.08 per cent copper and 85.82 per cent recovery, respectively, for the previous quarter.

The average cost per pound of net copper produced, including depreciation of plant and equipment and all fixed and general expenses, and after crediting gold, silver, and miscellaneous earnings, was 8.4c., as compared with 8.6c. for the preceding quarter, computed on the same basis.

The following tabulation shows the financial results of the company's operations for the quarter, as compared with the previous quarter:

	Second Quarter, 1925	First Quarter, 1925
Net profit from copper production	$2,343,443.41	$2,764,500.27
Miscellaneous income, including gold and silver	707,178.09	586,154.84
Bingham & Garfield Railway Co. dividend	75,000.00	75,000.00
Total income	$3,125,621.50	$3,425,655.11
Depreciation	298,569.61	294,250.21
To surplus	$2,827,051.89	$3,131,404.90

Earnings for the second quarter are computed on the basis of 13.53c. per pound carrying price for copper, as compared with 14.27c. for the first quarter. The total capping removed during the quarter was 2,245,347 cu.yd., as compared with 1,745,146 cu.yd. for the previous quarter.

The ore delivery department transported a total of 3,257,935 tons of ore, being an average of 35,801 tons per diem, as compared with 3,229,805 tons and 35,887 tons, respectively, for the previous quarter.

Metal Price Curves

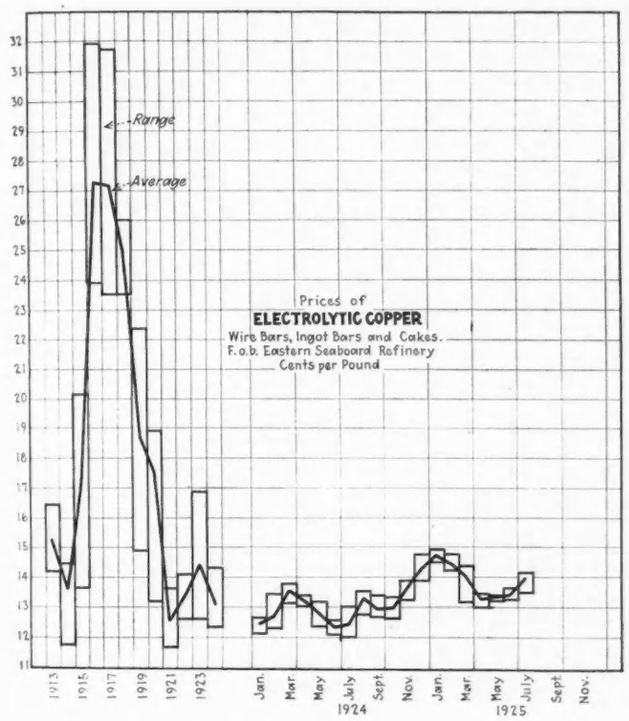
Upward Trend Continues to Be Feature of Current Prices

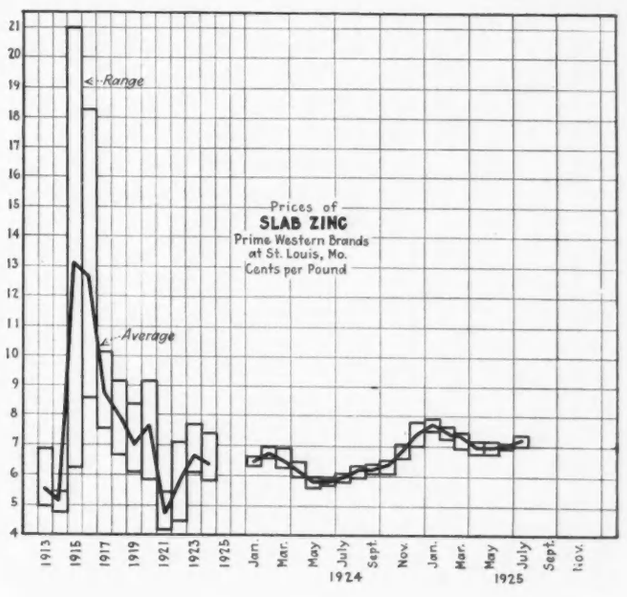
The features of the recent trend in prices of the four major non-ferrous metals is the steady improvement since the low figures of April. The current price of copper at 14.50c. refinery indicates a continuation of the trend. The high average of January, 1924, is clearly in sight, if the present tendency continues.

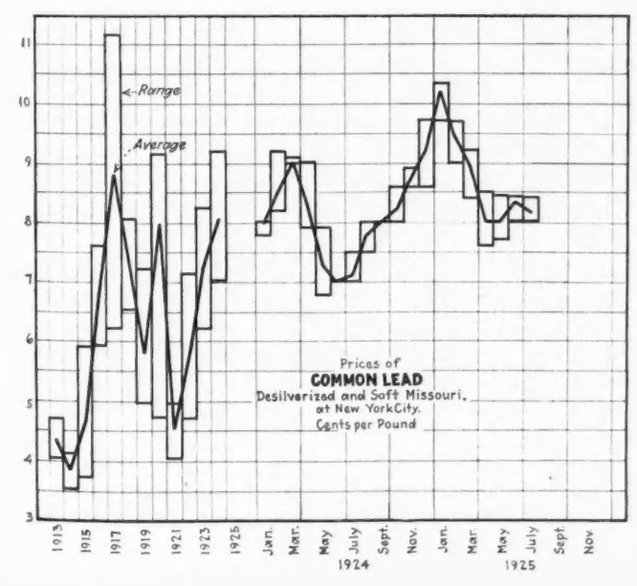
Silver was remarkably steady at just below 70c. during July and continues within an extremely narrow range. This is the best market since the brief climb to over 70c. in October, 1924. So far reports from India indicate favorable monsoons, and predictions of good crops and a consequent large capacity for absorbing silver are made by bullion dealers.

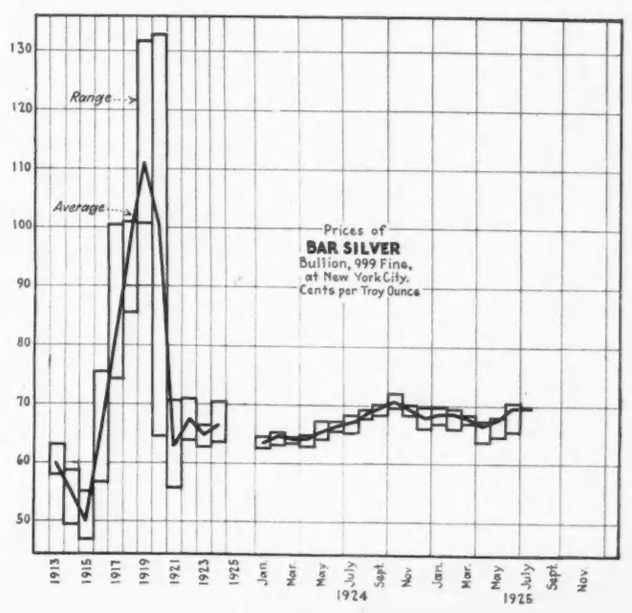
Developments since July in the lead market show the small decline in the July average to be entirely retrieved, the current price being on the high side of 9c., with the leading interests much averse to a runaway market. There is still a long way to go before the high point of last January is reached. The relative positions of the 1924-1925 monthly portion and the 1913-1923 annual portion of the accompanying lead curve contrast with those of the other metals. It shows the unique positions of lead among the non-ferrous metals.

Zinc has followed the course of the other metals, though the range has been comparatively narrow. The maintenance of a fair margin over the years 1921 to 1923 inclusive, with no wide fluctuations, has proved to be reasonably satisfactory to producers. The trend is upward thus far in August, the average for the last week being just over 7.55c.









Mining Stocks—Week Ended August 8, 1925

Stock	Exch.	High	Low	Last	Last Div.
COPPER					
Anaconda	New York	43	41½	43	Jy.18, Au.24, Q 0.75
Arcadian Consol.	Boston	1 1/16	1	1	
Ariz. Com'l	Boston	11⅛	10⅞	11⅛	Jy.21, Jy 31 SA 0.50
Calaveras	N. Y. Curb	1½	1½	1½	
Calumet & Arizona	New York	50⅞	49	50⅞	Jn.15, Jn.22 Q 0.50
Calumet & Hecla	Boston	15⅝	14½	15⅝	Ja.30, Mh.4 0.50
Canario Copper	N. Y. Curb	8	7½	8	
Cerro de Pasco	New York	53	52	52⅞	Au.21, Se.1, Q 1.75
Chile Copper	New York	34⅞	33⅜	34⅜	Sep.2,Sep.28,Q 0.62½
Chino	New York	24½	23	24½	Sept., 1920 0.37½
Con. Coppermines	N. Y. Curb	3⅛	1⅞	3⅛	
Copper Range	Boston	22	20	22	Ap.9, My.4 1.00
Crystal Copper	Boston Curb	*50	*45	*46	
East Butte	Boston	3⅞	3¼	3⅞	Dec., 1919 0.50
First National	Boston Curb	*18	*16	*16	Feb., 1919 0.15
Franklin	Boston			*80	
Granby Consol.	New York	16½	15½	16½	May, 1919 1.25
Greene-Cananea	New York	14	12¾	14	Nov., 1920 0.50
Hancock	Boston			*76	
HoweSound,new,r t.c.	N. Y. Curb			16½	April, 1924 0.05
Inspiration Consl.	New York	28⅜	27⅞	28⅜	Jn.18, Jy.6, Q 0.50
Iron Cap	Boston Curb	1 3/16	1 3/16	1 3/16	May, 1923 0.15
Isle Royale	Boston	13¼	11⅞	13	Sept., 1923 0.50
Jerome Verde Dev.	N. Y. Curb	1	1	1	
Kennecott	New York	55¼	53⅝	55⅛	Jn.5, Jy.1, Q 0.75
Lake Copper	Boston	1⅛	1	1⅛	Jn.1, Jn.15 Q 0.50
Magma Copper	NewYork	43¾	41⅞	43⅞	Jn. 15, Jy. 15, 0.75
Mason Valley	N. Y. Curb	1¾	1⅞	1¾	
Mass Consolidated	Boston	*60	*50	*50	Nov., 1917 1.00
Miami Copper	New York	10¼	9⅞	10¼	Au.1 Au.15 Q 0.25
Mohawk	Boston	32½	30	32	Aug. 1, Sept. 2 1.00
Mother Lode Coa.	New York	8⅛	7⅞	8	Jn. 12, Jn. 30 0.37½
Nevada Consol.	New York	14	13	13⅜	Sept., 1920 0.25
New Cornelia	Boston	20	19½	19¼	Aug. 7, Aug. 24 0.25
North Butte	Boston	1⅜	1	1⅛	Oct., 1918 0.25
Ohio Copper	N. Y. Curb	*77	*75	*76	No.14, De.2 0.05
Old Dominion	Boston	20	19½	19½	Dec., 1918 1.00
Phelps Dodge	Open Mar.	†112	†108		Jn 20, Jy.2 Q 1.00
Quincy	Boston	25	23	25	Mar., 1920 1.00
Ray Consolidated	New York	15⅛	14	15⅛	Dec., 1920 0.25
Ray Hercules	N. Y. Curb			14	
St. Mary's Min. Ld.	Boston	37	35	36½	Ap. 20, My.20, 3.00
Shannon	Boston	*60	*52	*55	Nov., 1917 0.25
Shattuck Arizona	New York	6½	6½	6½	Jan., 1920 0.25
Superior & Boston	Boston	1⅜	1⅛	1⅛	
Tenn. C. & C.	New York	11⅛	10⅝	10¾	De.31, Ja.15,Q 0.25
United Verde Ex.	N. Y. Curb	24	23	24	Jy. 6, Aug. 1 0.50
Utah Copper	New York	97⅜	97½	97½	Mh.20,Mh 31,Q 1.00
Utah Metal & T.	Boston	*50	*45	*50	Dec., 1917 0.30
Victoria	Boston	*30	*14	*14	
Walker Mining	Salt Lake	2.55	2.55	2.55	
NICKEL-COPPER					
Internat. Nickel	New York	31⅞	30½	31	March, 1919 0.50
Internat. Nickel pfd.	New York	99	98¼	99	Jy.16, Au.1, Q 1.50
LEAD					
Carnegie Lead & Zinc	Pittsburgh	7⅛	6⅞	6⅞	
Glad-tone M. M. Co.	Spokane	*22½	*22	*22½	Jy. 1, Jy. 10 0.01½
National Lead	New York	155½	152	154	Sep.11, Sep.30 2.00
National Lead pfd.	New York	117	117	117	Aug.21, Sep.15 1.75
St. Joseph Lead	New York	42⅛	41	41	Jn.9, Jn. 22, 0.50
ZINC					
Am. Z. L. & S.	New York	8	7¾	8	May, 1920 1.00
Am. Z. L. & S. pfd.	New York	29½	27¼	29½	Nov., 1920 1.50
Butte C. & Z.	New York	6⅛	5⅞	6⅛	De.10, De.24 0.50
Butte & Superior	New York	11⅞	11	11⅛	Mh.19, Mh.31 0.50
Callahan Zn-Ld	New York	2⅝	2½	2½	Dec., 1920 0.50
New Jersey Zn.	N. Y. Curb	191½	190	191½	Jn.20,Jy. 10 Ex. 2.00
United Zinc	N. Y. Curb			*35	
Yellow Pine	Los Angeles	*71½	*65	*70	De.10,De.15 Q 0.04
GOLD					
Alaska Juneau	New York	1⅞	1⅝	1⅞	
Argonaut	Toronto	*25½	*24	*24½	
Barry-Hollinger	Toronto	*44	*43½	*43½	
Carson Hill	Boston	*90	*20	*20	
Consol. W. Dome L.	Toronto	*14½	*13½	*14	
Cresson Consol. G.	N. Y. Curb	3¼	3	3	Mh.31, Ap.10 Q 0.10
Crown Reserve	Toronto	*15¾	*14½	*15	Jan 1917 0 05
Dome Mines	New York	14⅜	14	14¼	Mh.31,Ap.20,Q 0.50
Golden Cycle	Colo. Springs	1.51	1.48	1.48	Dec.11, 1924 0.03
Hollinger Consol.	Toronto	14.85	14.75	14.80	Jy.27, Au.12 0.08
Homestake Mining	New York	45½	45¼	45½	Au.20, Au.25 M 0.50
Kirkland Lake	Toronto	*43½	*43	*43	
Lake Shore	Toronto	6.52	6.21	6.45	Mh.2, Mh.16, 0 05
McIntyre-Porcupine	New York	19¾	19	19½	Aug.1, Sept.1 0.25
Newray	Toronto	*22½	*22½	*22½	
Night Hawk Pen.	Toronto			*21	
Portland	Colo. Springs	*38	*38	*38	Oct., 1920 0.01
Rand Mines	New York	39½	39¼	39⅜	Fe.17, Fe.25 1.79
Teck-Hughes	Toronto	1.70	1.67	1.69	
Tom Reed	Los Angeles	*55⅛	*52½	*55½	Dec., 1919 0.02
Tough-Oakes	Toronto	*35	*33	*33½	
United Eastern	N. Y. Curb			*47	July, 1924 0.05
Vipond Cons.	Toronto	1.22	1.20	1.21	
Wright-Hargreaves	Toronto	5.05	4.93	4.98	Jn.15, Jy.1 5.00
GOLD AND SILVER					
Black Oak	N. Y. Curb			*81	
Con. Cortez	N. Y. Curb			*7	
Con. Virginia	San Francisco	*5½	*4½	*5½	
Continental Mines	N. Y. Curb			1⅛	
Dolores Esperanza	N. Y. Curb			*60	July, 1923 0.05
Premier Gold	N. Y. Curb	2¼	2¼	2¼	Jn.18, Jy.1, 0.08
Tonopah Belmont	N. Y. Curb	*65	*65	*65	Sep. 15, Oct. 1, 0.05
Tonopah Divide	N. Y. Curb			*23	Oct., 1923 0.10
Tonopah Extension	N. Y. Curb	1⅛	1	1 3/16	Mh.11, Ap.1, Q 0.05
Tonopah Mining	N. Y. Curb	4	3¾	4	Mh.31, Ap.21, 0.07½
Unity Gold	N. Y. Curb	*85	*80	*80	
West End Consol.	N. Y. Curb			*50	Mar., 1923 0.05
Yukon Gold	N. Y. Curb			*35	June, 1918 0.02

Stock	Exch.	High	Low	Last	Last Div
SILVER					
Alvarado	Boston Curb			*50	Oct. 1920 0.50
Beaver Consol.	Toronto	*32	*31¼	*31½	May, 1920 0.03
Castle-Trethewey	Toronto	*91¼	*90	*91½	
Coniagas	Toronto	1.70	1.65	1.65	May, 1924 0.12½
Keeley	Toronto	1.85	1.70	1.83	Mh.1, Mh.15SA 0.12
Kerr Lake	N. Y. Curb	1½	1⅜	1⅜	Ap.1, Ap.15, Q 0.12½
La Rose	Toronto	*45	*44	*44¾	Apr., 1922 0.10½
Lorrain Trout Lake	Toronto	*93	*90	*90	Jy. 2, Jy.15 0 05
McKinley-Dar.-Sav.	Toronto	*26½	*26	*26	Oct., 1920 0.03
Mining Corp. Can.	Toronto	2.58	2.54	2.57	Jy.1, Jy.15 0.12½
Nipissing	N. Y. Curb	4⅞	4½	4⅝	Jn.30, Jy.20, Q 0.15
Ontario Silver	New York			7	Jan., 1919 0.50
Temiskaming	Toronto	*16½	*16½	*16½	Jan., 1920 0.40
SILVER-LEAD					
Ahumada	New York	10¼	10	10⅛	Jn.15,Jy.2,QEx 0.25
Bingham Mines	Boston	32	29¼	31¼	Jn.20, Jn.30 Q 0.50
Cardiff M. & M.	Salt Lake	1.50	1.40	1.50	De.16, No.18 0.10
Chief Consol.	Salt Lake			2.90	Ap 10, My. 1 0.10
Columbus Rexall	Salt Lake	*9	*8½	*9	Aug., 1923 0.05
Erupcion	Boston Curb	3	2⅛	2⅜	Jn.15,Jy.2,QEx 0.25
Federal M. & S.	New York	16⅞	16¾	16⅞	Fe.26, Mh.15 Q 1.75
Federal M. & S. pfd.	New York	58½	56	58½	My.25, Jn.15,Q 1.75
Hecla Mining	N. Y. Curb	16¼	15½	16⅜	Au.15, Se.15 Q 0.50
Iron Blossom Con.	Salt Lake			*39	Oc.25, 1924 0.01½
Iron King Mining	Salt Lake	*48	*36	*36	
Keystone Mining	Salt Lake	*79	*74	*78	Au.12, Au.26 0 07½
Mammoth Mining	Salt Lake	2 67½	2.60	2.67½	My.15 My.25 0 10
Marsh Mines	N. Y. Curb			*4	June, 1921 0.02½
Park City	Salt Lake	5.80	5.80	5.80	Jn.15, Jy.1 Q 0.15
Park Utah	Salt Lake	5.90	5.85	5.85	April, 1924 0.15
Prince Consol.	Salt Lake	*43	*35	*35	
Silver King Coal	Salt Lake	7.90	7.90	7.90	Jn.20, Jy.1, Q 0.25
Silversmith	Spokane	*19½	*18	*18	Jy.1, Jy.10 0.01
Tamarack-Custer	Spokane	*60	*57	*57	Sept. 1924 0.25
Tintic Standard	Salt Lake	11.50	11.50	11.50	Jn.24, Jn.29 Q 0.40
Utah-Apex	Boston	6	5⅝	6	Jy.3, Jy.15, Q 0.35
Western Utah Copper	N. Y. Curb			*11	
IRON					
Bethlehem Steel	New York	42⅝	40¾	42	July, 1924 1.25
Char. Iron	Detroit			*20	
Char. Iron pfd.	Detroit			*85	
Colorado Fuel & Iron	New York	43¾	41½	41½	May, 1921 0.75
Gt. North'n Iron Ore	New York			69½	Ap.11, Ap.30 1.00
Inland Steel	New York	42	41½	41½	Au. 14 Sep. 1,Q 0.62½
Mesabi Iron	N. Y. Curb	2¼	2¼	2¼	
Replogle Steel	New York	15¾	14	15¼	
Republic I. & S.	New York	49¾	47⅛	48½	May, 1921 1 50
Republic I. & S. pfd.	New York	90	90	90	Jn.17, Jy.1, Q 1.75
Sloss-Sheffield S. & I.	New York	103¾	101	103	Jn.10, Jn.20 Q 1.50
Sloss-Shef. S.&I. pfd.	New York			97½	Jn.20, Jy.1, Q 1.75
U. S. Steel	New York	123½	118¼	122¼	Au.29,Au.31 Q Ex 1.75
U. S. Steel pfd.	New York	125½	123¾	124¾	Aug. 3, Aug. 29, Q 1.75
Virginia I. C. & C.	New York			31	Jan., 1924 1.50
Virginia I.C.&C.pfd.	New York			73	Jn.20, Jy.2, 2.50
VANADIUM					
Vanadium Corp.	New York	29¾	28⅛	29¾	Aug.1, Aug.15 0.50
ASBESTOS					
Asbestos Corp.	Montreal			75	My.1, My.15 Q 1.00
Asbestos Corp., pfd.	Montreal			107⅛	Ap. 1, Ap. 15, Q 1.50
SULPHUR					
Freeport Texas	New York	17⅞	14⅞	17	Nov., 1919 1.00
Texas Gulf	New York	113⅞	109¼	111	Jn.1, Jn.15, Q 1.75
DIAMONDS					
De Beers Consol.	New York	24	21	24	Jy.27, Au.30 0.97
PLATINUM					
So. Am. Gold & P.	N. Y. Curb	2⅞	2⅝	2⅞	
MINING, SMELTING, REFINING AND GENERAL					
Amer. Metal	New York	50¼	49⅛	50¼	Aug. 20, Sep. 1, Q 0.75
Amer. Metal pfd.	New York	114⅜	114⅛	114⅜	Aug. 21, Sep. 1, Q 1.75
Amer. Sm. & Ref.	New York	108⅛	103¾	108	Jy.10, Au.1, Q 1.50
Amer.Sm.&Ref.pfd.	New York			111	Au.7, Se.1, Q 1.75
Consol. M. & S.	Montreal			102	Jn.30, Jy.15 0.75
Federated Metals	N. Y. Curb	26⅞	26	26	
Newmont Mining	N. Y. Curb	46	44	45	
Southwest Metals	N. Y. Curb			1	
U. S. Sm. R. & M.	New York	39⅞	37½	39¾	Jy.6, Jy.15 Q 0.75
U.S. Sm. R.&M.pfd.	New York	47	46	46	Jy.6, Jy.15 Q 0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange and George H. Watson & Co.; Colorado Springs, Colorado Springs Stock Exchange

LONDON QUOTATIONS, WEEK ENDED JULY 25

	High	Low	Last	Date	Per Cent
Aramayo Mines (25 frs.)	80/—	78.1½	78/9	May 1925	5(c)
British Platinum	7/—	6/9	7/—	Feb. 1925	2½
Bwana M'Kubwa	5/6	5/1½	5/4½		
Camp Bird	2/1½	1/9	2/1½		
El Oro	4/10½	4/—	4/9	Nov. 1924	2½*
Esperanza	1/—	—/10	1/—		
Frontino & Bolivia	11/6	11/3	11/6	July 1925	3½
Mexican Corporation	13/3	13/—	13/3		
Mexico Mines of El Oro	37/6	35/7½	36/3	June 1925	10*
Nechi (pref. 10s.)	1/3	1/—	1/3	1921–22	25
Oroville Dredging	7/—	6/10½	7/—	Dec. 1923	3¾
Ouro Preto	5 —	4/9	5/—	May 1925	2½
St. John del Rey	15/3	14/9	15/—	June 1925	6½
San Francisco Mines	24/10½	22/9	24/—	June 1925	15
Santa Gertrudis	9/1½	8/—	8/6	July 1920	5
Selukwe (2s. 6d.)	10/10½	9/9	9/9	April 1917	6¾
S. American Copper	7/10½	7/4½	7/6	Nov. 1917	75
Tanganyika	36/10½	32/6	35/—		
Tomboy	4/6	4/3	4/6	Feb. 1925	4½
Union Minière du Haut-Katanga (Brussels) 100 Fr.	5 970	6 000	6.005	July 1925	150(b)

* Free of British income tax. (b) Belgian francs. (c) Swiss francs.